User Manual

EDANUSA

SE-12 Series

Electrocardiograph

Version 1.0

CE 0123

About this Manual

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Statement

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Product Information

Product Name: Electrocardiograph

Model: SE-12, SE-12 Express

Responsibility of the Manufacturer

EDAN only considers itself responsible for any effect on safety, reliability and performance of the equipment if:

Assembly operations, extensions, re-adjustments, modifications or repairs are carried out by persons authorized by EDAN, and

The electrical installation of the relevant room complies with national standards, and

The instrument is used in accordance with the instructions for use.

Upon request, EDAN may provide, with compensation, necessary circuit diagrams, and other information to help qualified technician to maintain and repair some parts, which EDAN may define as user serviceable.

Terms Used in this Manual

This guide is designed to give key concepts on safety precautions.

WARNING

A **WARNING** label advises against certain actions or situations that could result in personal injury or death.

CAUTION

A **CAUTION** label advises against actions or situations that could damage equipment, produce inaccurate data, or invalidate a procedure.

NOTE

A **NOTE** provides useful information regarding a function or a procedure.

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Chapter 1 Safety Guidance

This chapter provides important safety information related to the use of the 12-channel electrocardiograph.

1.1 Intended Use

The intended use of the 12-channel electrocardiograph is to acquire ECG signals from adult and pediatric patients through body surface ECG electrodes. The electrocardiograph is only intended to be used in hospitals or healthcare facilities by doctors and trained healthcare professionals. The cardiogram recorded by the electrocardiograph can help users to analyze and diagnose heart disease. However, the interpreted ECG with measurements and interpretive statements is offered to clinicians on an advisory basis only.

WARNING

1. This equipment is not designed for internal use or direct cardiac application.
2. This equipment is not intended for home use.
3. This equipment is not intended for treatment or monitoring.
4. This equipment is intended for use on adult and pediatric patients only.
5. The results given by the equipment should be examined based on the overall clinical condition of the patient, and they can not substitute for regular checking.

1.2 Warnings and Cautions

In order to use the electrocardiograph safely and effectively, and avoid possible dangers caused by improper operation, please read through the user manual and be sure to be familiar with all functions of the equipment and proper operation procedures before use.

Please pay more attention to the following warning and caution information.

1.2.1 Safety Warnings

WARNING

1. The electrocardiograph is intended to be used by qualified physicians or personnel professionally trained. They should be familiar with the contents of this user manual before operation.
2. Only qualified service engineers can install this equipment, and only service engineers authorized by the manufacturer can open the shell.
3. **EXPLOSION HAZARD** - Do not use the electrocardiograph in the presence of flammable anesthetic mixtures with oxygen or other flammable agents.
4. **SHOCK HAZARD** - The power receptacle must be a hospital grade grounded outlet. Never try to adapt the three-prong plug to fit a two-slot outlet.
5. Make sure that the power is turned off and the power cord is disconnected from the AC socket before connecting or disconnecting equipment. Otherwise, electrical shock or other injuries may happen to the patient or operator.
6. If the integrity of the external protective conductor is in doubt, the equipment should be powered by an internal rechargeable battery.
7. Do not use this equipment in the presence of high static electricity or high voltage equipment which may generate sparks.
8. Only the patient cable and other accessories supplied by the manufacturer can be used. Or else, the performance and electric shock protection can not be guaranteed. The electrocardiograph has been safety tested with the recommended accessories, peripherals, and leads.
9. Make sure that all electrodes are connected to the patient correctly before operation.
10. Ensure that the conductive parts of electrodes and associated connectors, including neutral electrodes, do not come in contact with earth or any other conducting objects.
11. Electrodes with defibrillator protection should be used while defibrillating.
12. If reusable electrodes with electrode gel are used during defibrillation, electrocardiograph recovery will take more than 10 seconds. The manufacturer recommends the use of disposable electrodes at all times.
13. Electrodes of dissimilar metals should not be used; otherwise it may cause a high polarization voltage.

WARNING

14. The disposable electrodes can only be used for one time.
15. No hazard is found when the electrocardiograph is operated with cardiac pacemakers or other stimulators.
16. Do not touch the patient, bed, table or the equipment while using the ECG together with a defibrillator.
17. Do not touch accessible parts of non-medical electrical equipment and the patient simultaneously.
18. The use of equipment that applies high frequency voltages to the patient (including electrosurgical equipment and some respiration transducers) is not supported and may produce undesired results. Disconnect the patient data cable from the electrocardiograph, or detach the leads from the patient prior to performing any procedure that uses high frequency surgical equipment.
19. If the wireless AP technology is used, in order to maintain compliance with the FCC RF exposure guidelines, the wireless AP should be installed and operated with a minimum distance of 20cm between the radiator and the human body. There should be no shield in or around the room where the wireless AP is used.
20. Fix attention on the examination to avoid missing important ECG waves.
21. **SHOCK HAZARD** - Don’t connect non-medical electrical equipment, which has been supplied as a part of the system, directly to the wall outlet when the non-medical equipment is intended to be supplied by a multiple portable socket-outlet with an isolation transformer.
22. **SHOCK HAZARD** - Don’t connect electrical equipment, which has not been supplied as a part of the system, to the multiple portable socket-outlets supplying the system.
23. Do not connect any equipment or accessories that are not approved by the manufacturer or that are not IEC/EN 60601-1-1 approved to the electrocardiograph. The operation or use of non-approved equipment or accessories with the electrocardiograph is not tested or supported, and electrocardiograph operation and safety are not guaranteed.
24. Any non-medical equipment (such as the external printer) is not allowed to be used within the patient vicinity (1.5m/6ft.).
25. Do not exceed the maximum permitted load when using multiple portable socket-outlets to supply the system.

WARNING

26. Multiple portable socket-outlets shall not be placed on the floor.
27. Do not use the additional multiple portable socket-outlet or extension cord in the medical electrical system, unless it's specified as part of the system by manufacturer. And the multiple portable socket-outlets provided with the system shall only be used for supplying power to equipment which is intended to form part of the system.
28. Accessory equipment connected to the analog and digital interfaces must be certified according to the respective IEC/EN standards (e.g. IEC/EN 60950 for data processing equipment and IEC/EN 60601-1 for medical equipment). Furthermore all configurations shall comply with the valid version of the standard IEC/EN 60601-1-1. Therefore anybody, who connects additional equipment to the signal input or output connector to configure a medical system, must make sure that it complies with the requirements of the valid version of the system standard IEC/EN 60601-1-1. If in doubt, consult our technical service department or your local distributor.
29. Parts and accessories used must meet the requirements of the applicable IEC/EN 601 series safety standards, and/or the system configuration must meet the requirements of the IEC/EN 60601-1-1 medical electrical systems standard.
30. Connecting any accessory (such as external printer) or other device (such as the computer) to this electrocardiograph makes a medical system. In that case, additional safety measures should be taken during installation of the system, and the system shall provide:
    a) Within the patient environment, a level of safety comparable to that provided by medical electrical equipment complying with IEC/EN 60601-1, and
    b) Outside the patient environment, the level of safety appropriate for non-medical electrical equipment complying with other IEC or ISO safety standards.
31. If multiple instruments are connected to a patient, the sum of the leakage currents may exceed the limits given in the IEC/EN 60601-1 and may pose a safety hazard. Consult your service personnel.
32. The potential equalization bar can be connected to that of other equipment when necessary. Make sure that all these devices are connected to the potential equalization terminal.

1.2.2 Li-ion Battery Care Warnings

WARNING

1. Improper operation may cause the internal li-ion battery (hereinafter called battery) to be hot, ignited or exploded, and it may lead to the decrease of the battery capacity. It is necessary to read the user manual carefully and pay more attention to warning messages.
2. Only qualified service engineers authorized by the manufacturer can open the battery compartment and replace the battery, and batteries of the same model and specification should be used.
3. **DANGER OF EXPLOSION** -- Do not reverse the anode and the cathode when installing the battery.
4. Do not heat or splash the battery or throw it into fire or water.
5. Do not destroy the battery; do not pierce battery with a sharp object such as a needle; do not hit with a hammer, step on or throw or drop to cause strong shock; do not disassemble or modify the battery.
6. When leakage or foul smell is found, stop using the battery immediately. If your skin or cloth comes into contact with the leakage liquid, cleanse it with clean water at once. If the leakage liquid splashes into your eyes, do not wipe them. Irrigate them with clean water first and go to see a doctor immediately.
7. Properly dispose of or recycle the depleted battery according to local regulations.
8. Only when the device is off can the battery be installed or removed.
9. Remove the battery from the electrocardiograph when the electrocardiograph is not used for a long time.
10. If the battery is stored alone and not used for a long time, we recommend that the battery should be charged at least once every 6 months to prevent overdischarge.

1.2.3 General Cautions

CAUTION

1. Avoid liquid splash and excessive temperature. The temperature must be kept between 5 ºC and 40 ºC during operation, and it should be kept between -20 ºC and 55 ºC during transportation and storage.

CAUTION

2. Do not use the equipment in a dusty environment with bad ventilation or in the presence of corrosive.
3. Make sure that there is no intense electromagnetic interference source around the equipment, such as radio transmitters or mobile phones etc. Attention: large medical electrical equipment such as electrosurgical equipment, radiological equipment and magnetic resonance imaging equipment etc. is likely to bring electromagnetic interference.
4. Ruptured fuse must only be replaced with that of the same type and rating as the original.
5. The device and accessories are to be disposed of according to local regulations after their useful lives. Alternatively, they can be returned to the dealer or the manufacturer for recycling or proper disposal. Batteries are hazardous waste. Do NOT dispose of them together with house-hold garbage. At the end of their lives hand the batteries over to the applicable collection points for the recycling of waste batteries. For more detailed information about recycling of this product or battery, please contact your local Civic Office, or the shop where you purchased the product.
6. Federal (U.S.) law restricts this device to sale by or on the order of a physician.

1.2.4 Preparation and Operation Warnings (for SE-12 Express Exercise ECG)

WARNING

1. Ensure that the main unit and the treadmill/ergometer are effectively grounded.
2. Test the emergency stop switch of the treadmill before using the system.
3. During the exercise test, ensure that there are at least 2 experienced physicians present. One of them observes the patient and deals with the emergency.
4. Make sure that there is necessary valid first-aid equipment such as defibrillators, blood-pressure meters etc, and necessary valid medication in the exercise test room.
5. Turn off the system power and disconnect the power cord from the wall outlet after using the system.
6. Press down the emergency stop switch of the treadmill before defibrillating to avoid the hazard to the patient and the operator.

WARNING

7. Keep the treadmill/ergometer on a horizontal place and make sure it's stably working.
8. Make sure that the power cable of the treadmill/ergometer is grounded. Don't use other electrical equipment with the same power supply line.
9. Keep the power cable far away from the running treadmill area and the heat surface.
10. Examine the treadmill/ergometer carefully before using it.
11. Do not take an exercise test if the treadmill/ergometer is wet.
12. Do not use the treadmill/ergometer in the open air.
13. The patient undergoing the stress exercise test should wear suitable clothes and shoes.
14. During the stress exercise test, the patient should not get on or off the treadmill.
15. Remind patients to take care not to fall down from the treadmill.
16. Keep hands, hair, jewelry and loose clothing away from moving parts of the treadmill.
17. After the exercise test, slow the speed of the treadmill to the minimum, and then stop the treadmill.
18. Children are prohibited from approaching the treadmill/ergometer alone.
19. Don't insert anything into the treadmill, or place anything on its surface.
20. Press down the emergency stop switch to stop the treadmill immediately an emergency happens.

1.2.6 Contraindications (for SE-12 Express Exercise ECG)

Absolute Contraindications:

1. Acute MI (within 2 days)
2. High-risk unstable angina
3. Hemodynamic compromise caused by uncontrolled cardiac arrhythmia
4. Active endocarditis
5. Symptomatic severe aortic stenosis

6. Decompensated symptomatic heart failure
7. Acute pulmonary embolus or pulmonary infarction
8. Acute noncardiac disorder that may affect exercise performance or be aggravated by exercise (eg, infection, renal failure, thyrotoxicosis)
9. Acute myocarditis or pericarditis
10. Physical disability that would preclude safe and adequate test performance
11. The patient opposes the test.

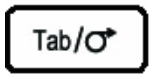
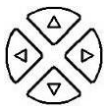
Relative Contraindications:

1. Left main coronary stenosis or its equivalent
2. Moderate stenotic valvular heart disease
3. Electrolyte abnormalities
4. Tachyarrhythmias or bradyarrhythmias
5. Atrial fibrillation with uncontrolled ventricular rate
6. Hypertrophic cardiomyopathy
7. Patients can not cooperate because of mental impairment
8. High-degree AV block

1.3 List of Symbols

	External output
	External input
	Equipment or part of CF type with defibrillator proof
	Caution
	Consult Instructions for Use

	Potential equalization
	Mains supply
	USB socket
	Battery indicator
	Battery recharging indicator
	Delete key
	Enter key
	Esc key/Reset key
	Shift key
	Fn key
	Power On/Off key
	COPY key
	MODE key
	SLEEP/WAKE UP key
	START/STOP key

	Tab key/Feed paper key
	UP/DOWN/LEFT/RIGHT Arrow key
	Recycle
P/N	Part Number
	Serial Number
	Date of Manufacture
	Manufacturer
	Authorized Representative in the European Community
	The symbol indicates that the device complies with the European Council Directive 93/42/EEC concerning medical devices.
	With respect to electrical shock, fire and mechanical hazards only in accordance with UL 60601-1and CAN/CSA C22.2 No. 601.1
Rx only (U.S.)	Federal (US) law restricts this device to sale by or on the order of a physician.
	It indicates that the device should be sent to the special agencies according to local regulations for separate collection after its useful life.

Chapter 2 Introduction

The 12-channel electrocardiograph gathers ECG signals of 12 leads simultaneously. It displays the operation menu, ECG parameters as well as electrocardiograms.

The 12-channel ECG waves can be viewed on the LCD screen and printed out by using a high-quality thermal recorder. The sampled ECG data can be saved, transmitted and exported.

The manual, auto, rhythm, R-R analysis or off mode can be chosen freely.

For SE-12 Express, the exercise ECG function is optional. When a patient with coronary heart disease runs, the added heart load will cause myocardium hypotension, and then the ECG will change abnormally. Therefore, the exercise ECG function of SE-12 Express can be used to diagnose concealed coronary heart disease and atypical angina pectoris, prescribe the workload for patients with myocardial infarction before they leave hospital, and assess the effect of the treatment.

The 12-channel electrocardiograph can be powered by the mains supply or battery.

With a high resolution thermal recorder, a 32-bit processor and a large-capacity memorizer, the 12-channel electrocardiograph has advanced performance and high reliability. The compact size makes it suitable for clinic and hospital uses.

The 12-channel electrocardiograph has two models: SE-12 and SE-12 Express.

SE-12 adopts 320×240 dot single color LCD screen; SE-12 Express adopts 800×600 multicolor LCD screen.

Configuration: main unit, power cord, patient cable, chest electrodes, limb electrodes, disposable electrodes, alligator clips, thermal recorder paper, fuses, battery.

NOTE: The pictures and windows in this manual are for reference only.

2.1 Top Panel

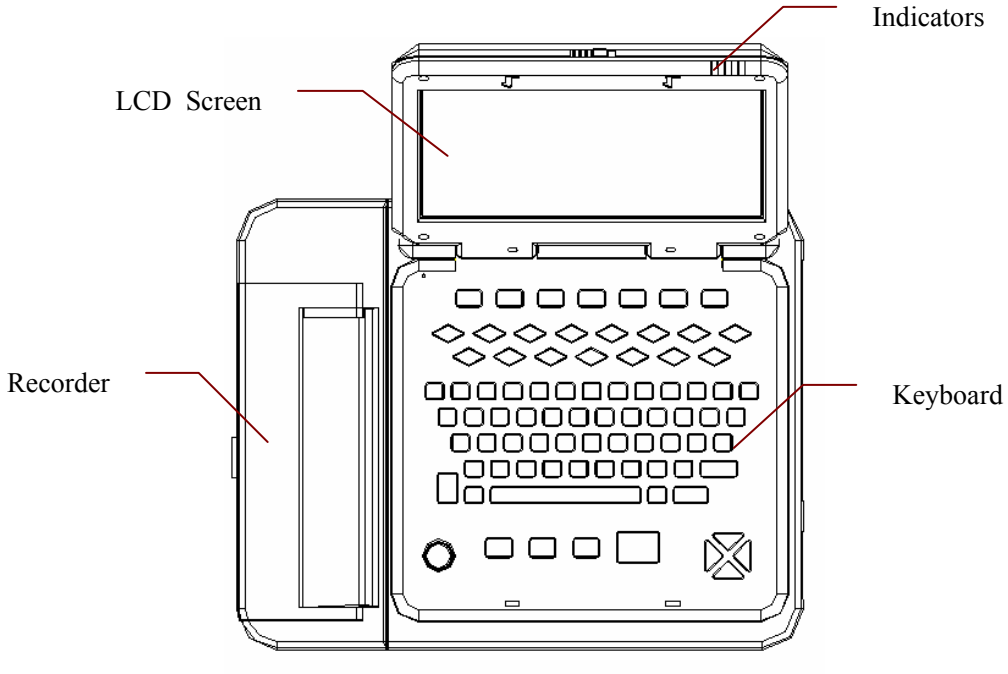


Figure 2-1 SE-12 Express

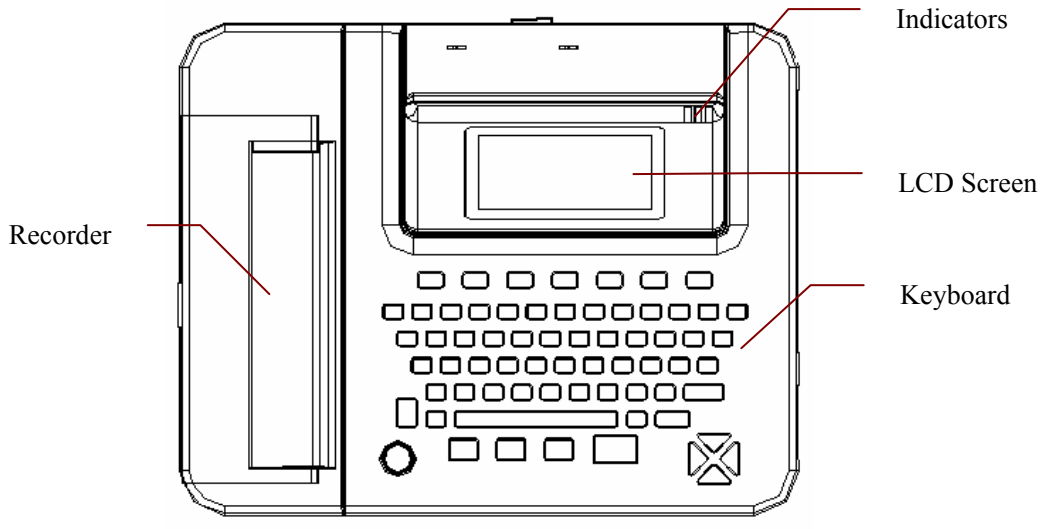


Figure 2-2 SE-12

2.2 Keyboard and Keys

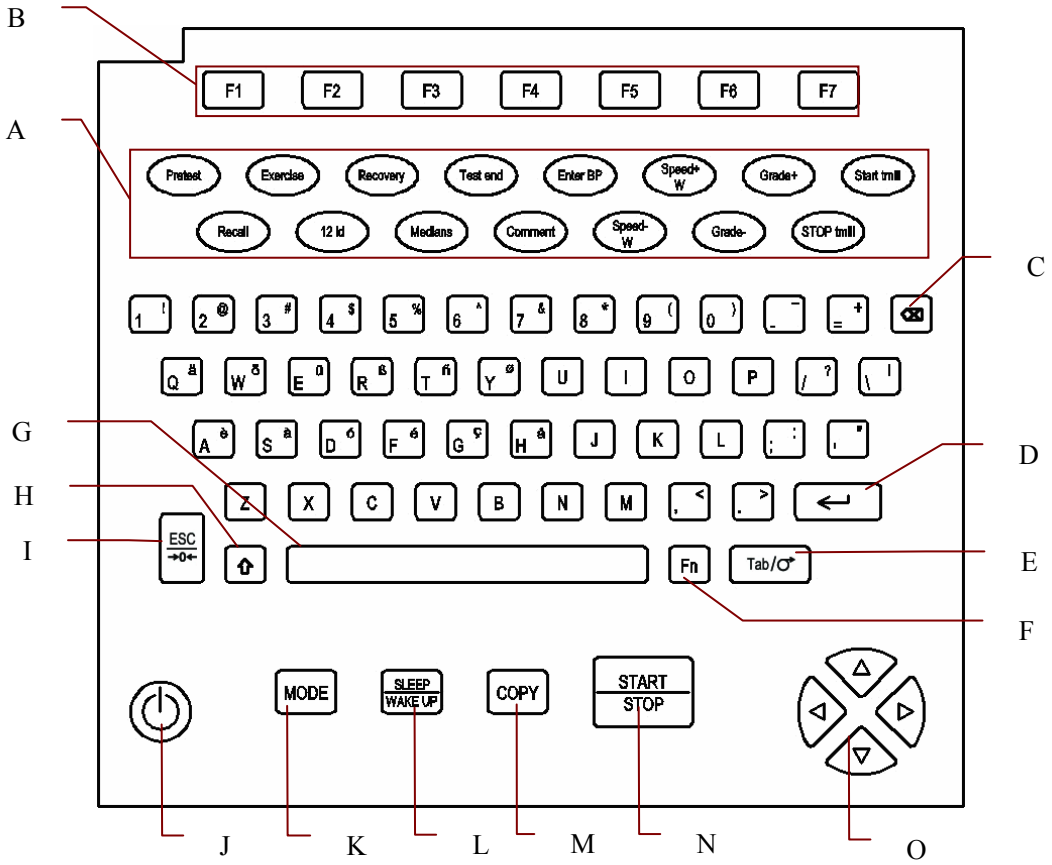


Figure 2-3 SE-12 Express Keyboard

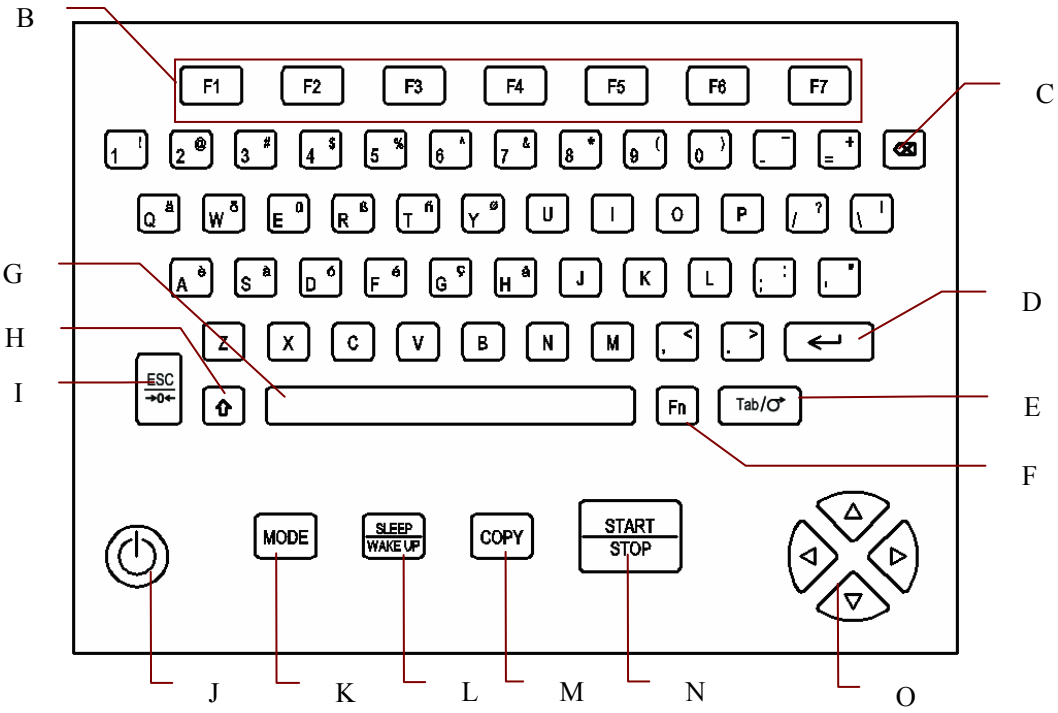


Figure 2-4 SE-12 Keyboard

	Name	Explanation
A **NOTE:** Only if the stress ECG function is activated, can these keys be available.	Pretest	When the main screen is displayed, press this key to display the main screen of the exercise test. When the main screen of the exercise test is displayed, press this key to enter the pretest phase. The length of the pretest phase is not fixed.
	Exercise	Press this key to enter the exercise phase. In the exercise phase, press this key to enter the next stage of the exercise phase.
	Recovery	Press this key to enter the recovery phase. In the recovery phase, press this key to enter the next stage of the recovery phase.
	Test end	Press this key to display a pop-up dialog box, and then you can decide whether the exercise test should be terminated.
	Enter BP	Press this key to display the **Input BP** dialog box, and then enter the BP values manually.
	Recall	During the exercise test, press this key to review 10s data and print out the 12-channel ECG report of the reviewed 10s data.
	12 ld	During the exercise test, press this key to sample 10s data and print out the 12-channel ECG report of the sampled 10s data.
	Medians	During the exercise test, press this key to print out the average template report.
	Comment	Press this key to display the **Comment** dialog box, and then you can annotate in the dialog box. The annotations will be displayed in the summary report. Press this key again to close the dialog box.
	Speed +/-W	Press **Speed +/-W** to change the speed of the treadmill during the exercise phase. **NOTE:** The two keys are available for the customized treadmill protocol only.
	Grade +/-	Press **Grade +/-** to change the grade of the treadmill during the exercise phase. **NOTE:** The two keys are available for the customized treadmill protocol only.

	Start/Stop tmill	Before the exercise test, press **Start tmill** to test the connection between the electrocardiograph and the treadmill, and then press **Stop tmill** to stop the connection test.
B	Function Key	Selecting menu functions on the screen
C	Delete	Deleting characters
D	Enter	Confirming operation
E	Tab/Feed paper	Moving the cursor Pressing **Tab** can move the cursor forward, and pressing Shift + **Tab** can move the cursor backward. Feed paper: when the main screen is displayed, if **Paper Marker** is set to **Yes**, you can press the **Tab** key to advance the recorder paper to the next black marker; if **Paper Marker** is set to **No,** you can press the **Tab** key to advance the paper for 2.5cm. Press the **Tab** key again to stop advancing the paper.
F	Fn	Inputting special characters. Press **Fn** + **a** to type **è**.
G	Spacebar	Adding a space between typed characters or selecting/deselecting a checkbox
H	Shift	Pressing Shift + **Tab** can move the cursor backward. Press Shift and a number key to input the special character in the top right corner of the key. If **Caps Lock** is set to **Off**, pressing Shift + **P** can type a capital **P**. If **Caps Lock** is set to **On**, pressing Shift + **P** can type a lowercase **p**.
I	Esc/Reset	Canceling operation **NOTE:** A large polarization voltage may cause baseline drift. On the main screen, pressing the **ESC** key can decrease the polarization voltage and draw the baseline to zero quickly.
J	Power On/Off	Power-on/Power-off
K	MODE	Press this key to select a working mode among the auto, manual, rhythm, R-R analysis, and off modes. **NOTE:** Only if a working mode is ticked in the Work Mode Setup window, can the working mode be selected by pressing the **MODE** key when the main screen is displayed.

L	SLEEP/WAKE UP	Resting/wakening the electrocardiograph
M	COPY	In the auto mode, pressing the **Copy** key can print the ECG report which was printed out last time.
N	START/STOP	Start/Stop printing reports
O	Arrow Keys	Moving the cursor (Up, Down, Left, Right) In the manual mode, press the Up or Down arrow to switch the lead groups. During the exercise test, pressing the Up or Down arrow can switch the display style. When the display style is 3×1, pressing the Left or Right arrow can switch the lead group.

2.3 Front Panel

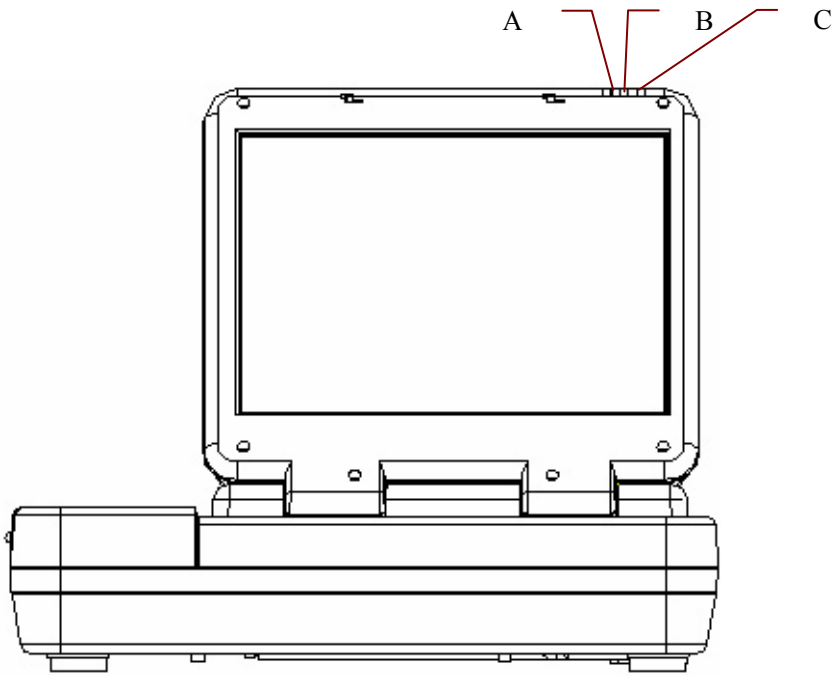


Figure 2-5 SE-12 Express Front Panel

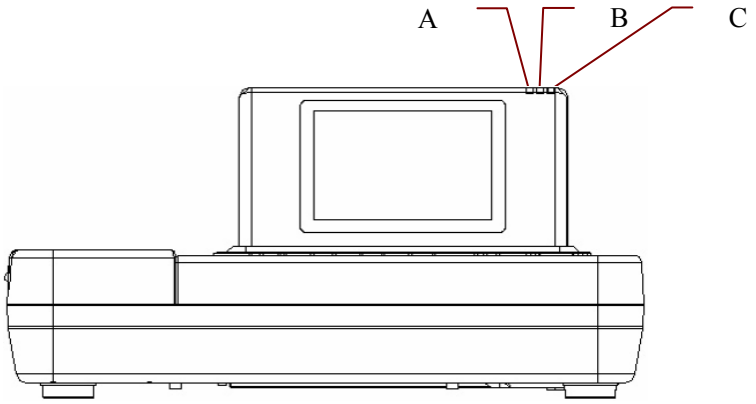


Figure 2-6 SE-12 Front Panel

	Symbol	Name	Explanation
A	~	Mains supply indicator	When the device is powered by the mains supply, this indicator is lit.
B		Battery indicator	When the device is powered by battery, this indicator is lit.
C		Battery recharging indicator	When the battery is being recharged, this indicator is lit.

2.4 Rear Panel

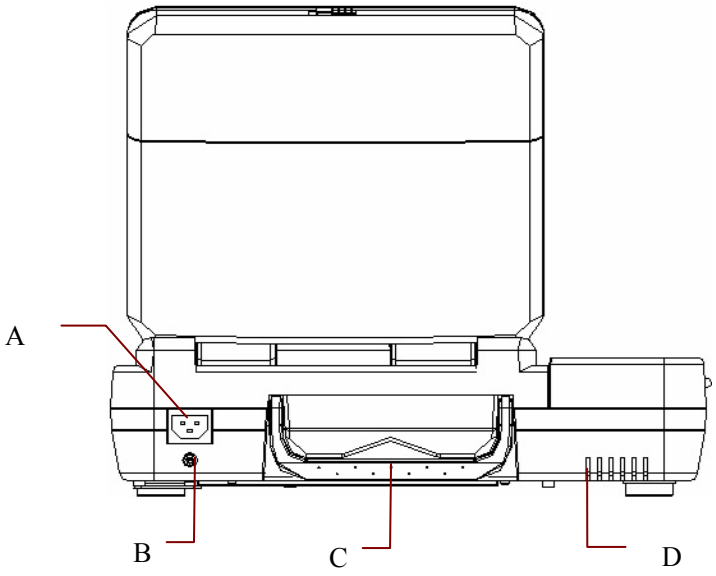


Figure 2-7 SE-12 Express Rear Panel

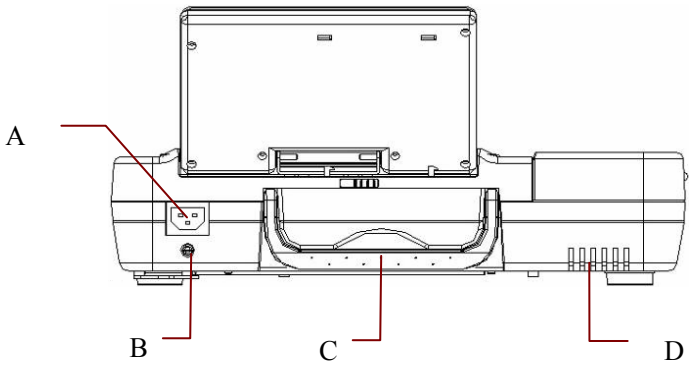


Figure 2-8 SE-12 Rear Panel

	Name	Explanation
A	Mains Supply Socket	~ AC SOURCE: alternating current supply socket
B	Potential Equalization Conductor	Potential equalization conductor provides a connection between the unit and the potential equalization bus bar of the electrical installation.
C	Handle	Part for people to hold
D	Heat Emission Hole	Path for internal heat emission

2.5 Right Panel

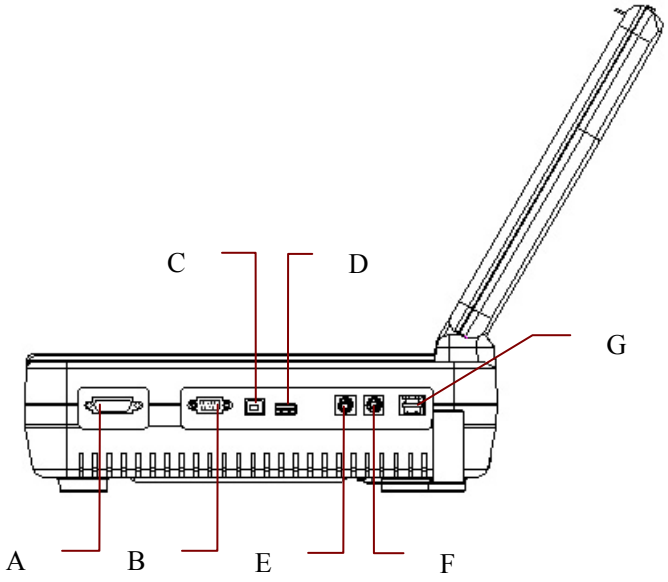


Figure 2-9 SE-12 Express Right Panel

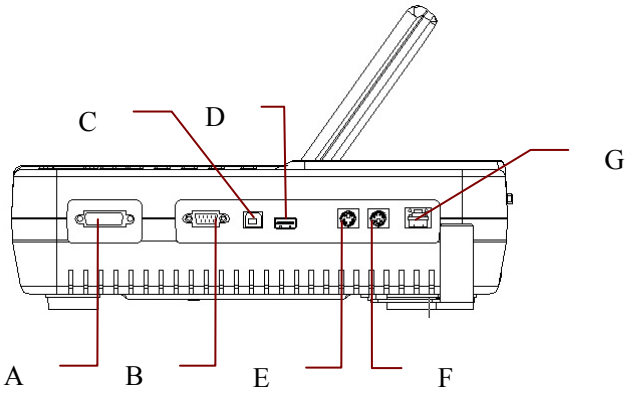
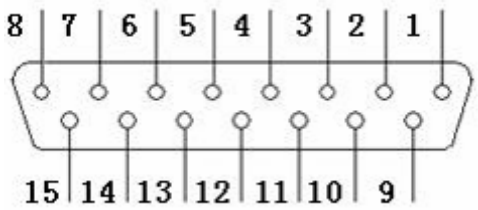


Figure 2-10 SE-12 Right Panel

	Name	**Explanation**
A	Patient Cable Socket	Connecting to the patient cable
B	Serial Port 1	Connecting to a PC In the exercise test, only the treadmill/ergometer recommended by the manufacturer can be connected.
C	USB Socket 1 (Optional)	Standard USB socket, connecting to a PC
D	USB Socket 2 (Optional)	Standard USB socket, connecting to a U disk, a bar code reader or a USB printer recommended by the manufacturer
E	External Input / Output Socket	Connecting to the external signal device
F	Serial Port 2	In the exercise test, only the BP Monitor recommended by the manufacturer can be connected.
G	Net port	Standard net port, connecting to a PC

1) Patient Cable Socket



: Applied part of type CF with defibrillator proof

: Caution

Definitions of corresponding pins:

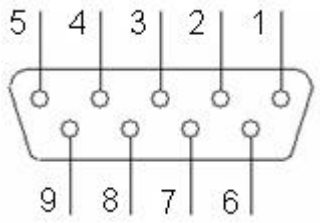
Pin	Signal	Pin	Signal	Pin	Signal
1	C2 / V2	**6**	SH	**11**	F / LL
2	C3 / V3	**7**	NC	**12**	C1 / V1 or NC
3	C4 / V4	**8**	NC	**13**	C1 / V1
4	C5 / V5	**9**	R / RA	**14**	RF (N) /RL or NC
5	C6 / V6	**10**	L / LA	**15**	RF (N) / RL

NOTE: The left side of "/" is European standard, and the right side is American standard.

2) Serial Port 1

WARNING

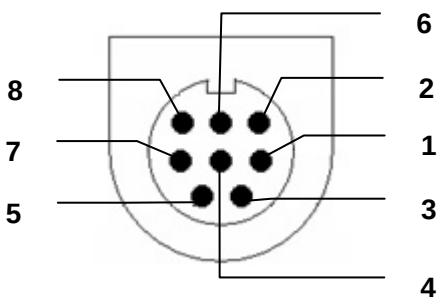
The isolated intensity of serial port 1 is 1500V AC and the maximum voltage applied should not exceed +15V DC.



Definitions of corresponding pins:

Pin	Signal	Pin	Signal	Pin	Signal
1	NC	**4**	NC	**7**	NC
2	RxD (input)	**5**	GND	**8**	NC
3	TxD (output)	**6**	NC	**9**	NC

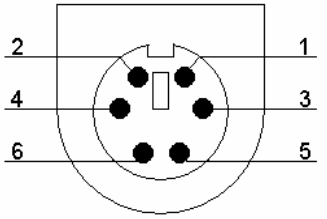
3) Serial Port 2



Definitions of corresponding pins:

Pin	Signal	Pin	Signal
1	TxD (output)	**5**	NC
2	RxD (input)	**6**	NC
3	NC	**7**	GND
4	NC	**8**	GND

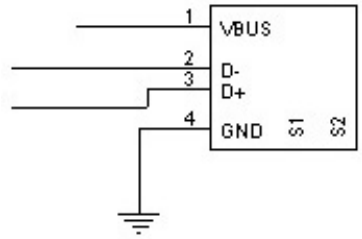
4) External Input/Output Socket



Definitions of corresponding pins:

Pin	Signal	Pin	Signal
1	GND	**4**	GND
2	GND	**5**	ECG Signal (input)
3	GND	**6**	ECG Signal (output)

5) USB Socket 1/USB Socket 2 (Optional)



CAUTION

Only the USB equipment recommended by the manufacturer can be connected to the USB interface.

Definitions of corresponding pins:

Pin	Signal	Pin	Signal
1	+5V	**3**	D+
2	D-	**4**	GND

WARNING

1. Accessory equipment connected to the analog and digital interfaces must be certified according to the respective IEC/EN standards (e.g. IEC/EN 60950 for data processing equipment and IEC/EN 60601-1 for medical equipment). Furthermore all configurations shall comply with the valid version of the standard IEC/EN 60601-1-1. Therefore anybody, who connects additional equipment to the signal input or output connector to configure a medical system, must make sure that it complies with the requirements of the valid version of the system standard IEC/EN 60601-1-1. If in doubt, consult our technical service department or your local distributor.

2. If multiple instruments are connected to a patient, the sum of the leakage currents may exceed the limits given in the IEC/EN 60601-1 and may pose a safety hazard. Consult your service personnel.

2.6 Bottom Panel

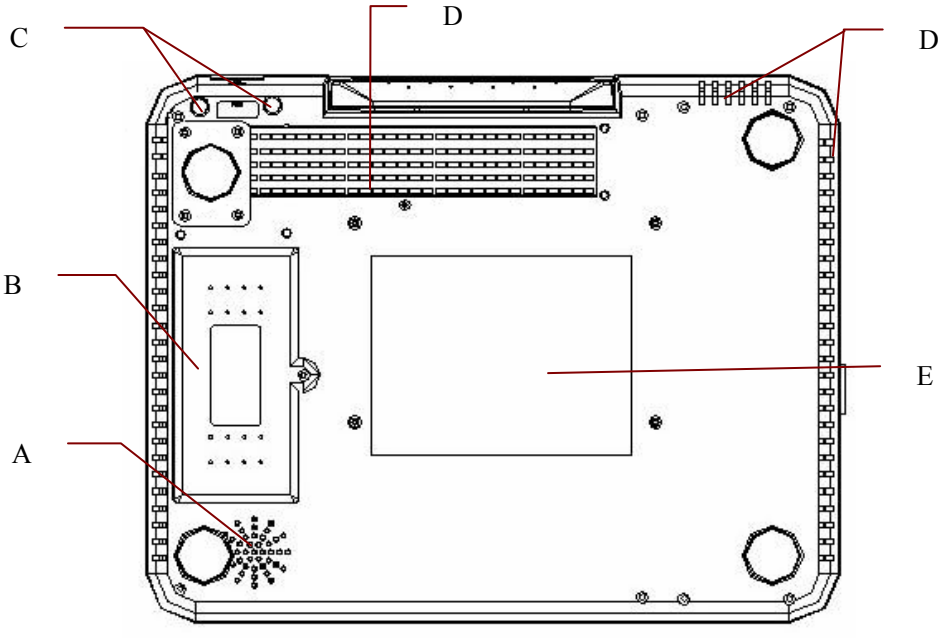


Figure 2-11 SE-12 Express Bottom Panel

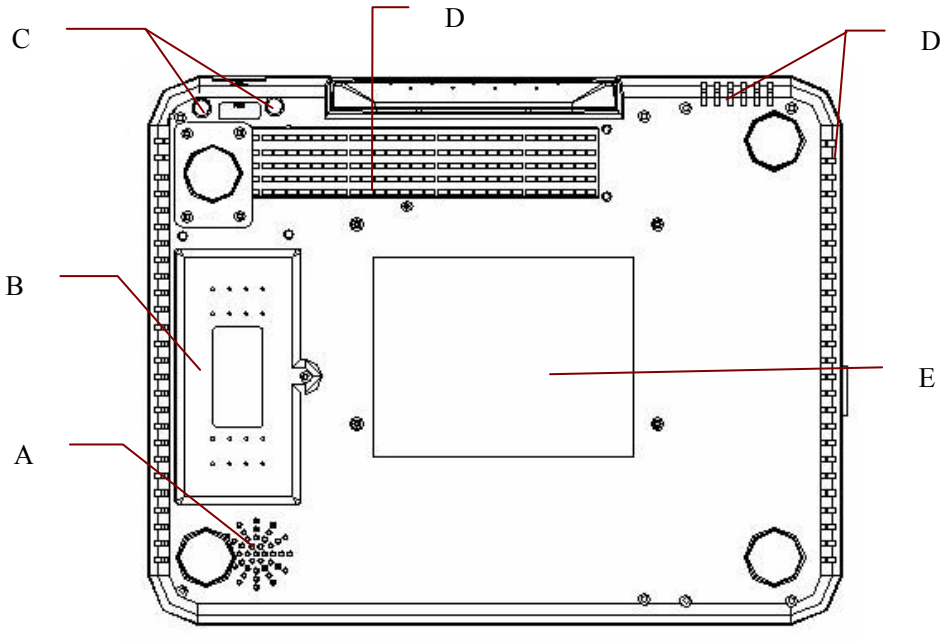


Figure 2-12 SE-12 Bottom Panel

	Name	**Explanation**
A	Speaker Hole	Path for sound from speaker
B	Battery Compartment	Compartment for battery
C	Fuse	The specification is: T1AL250VP Ø5×20
D	Heat Emission Hole	Path for internal heat emission
E	Label	Position for product information label

1) Battery Compartment

The rated voltage and the rated capacity of the battery pack are as follows:

SE-12 Express: Rated Voltage: 14.8V; Rated Capacity: 4400mAh

SE-12: Rated Voltage: 14.8V; Rated Capacity: 2200mAh

WARNING

1. Improper operation may cause the battery to be hot, ignited or exploded, and it may lead to the decrease of the battery capacity. Therefore, it is necessary to read the user manual carefully and pay more attention to warning messages.

WARNING

2. When leakage or foul smell is found, stop using the battery immediately. If your skin or cloth comes into contact with the leakage liquid, cleanse it with clean water at once. If the leakage liquid splashes into your eyes, do not wipe them. Irrigate them with clean water first and go to see a doctor immediately.
3. Only qualified service engineers authorized by the manufacturer can open the battery compartment and replace the battery, and batteries of the same model and specification must be used.
4. Only when the device is off can the battery be installed or removed.

NOTE: If the battery has not been used for two months or more, you should recharge it before using it again.

2) Fuse

There are two fuses of the same specification installed on the bottom of the main unit. The specification is: T1AL250VP Ø5×20.

WARNING

Ruptured fuses must only be replaced with those of the same type and rating as the original.

2.7 Function Features

- Supporting multi-language
- Full alphanumeric keyboard (For SE-12 Express, touch screen is available)
- Battery with large capacity
- ECG signals of 12 leads are gathered and amplified simultaneously, 12-channel waves are displayed and recorded simultaneously
- High resolution thermal recorder, recording frequency response ≤150Hz
- Supporting external USB printer

- Flexible printing formats
- The auto, manual, rhythm, R-R analysis and off modes can be chosen freely
- Automatic baseline adjustment for optimal printing
- Convenient operation of system setup and file management
- Multiple file formats: DAT/SCP/FDA-XML/PDF
- Measurement function and interpretation function
- Hint information of lead off, lack of paper, low battery capacity etc.
- Supporting bar code reader
- ECG data can be transmitted to the PC software through the serial cable, net cable, or wireless AP (optional).
- Real-time transmission to PC ECG

The following features are only for the exercise test function of SE-12 Express (optional)

- Real-time analysis, ST segment and trend are applied while sampling;
- Real-time display and print of 12-lead simultaneous ECG waveforms;
- ST segment analysis while sampling; ST position is adjustable while sampling;
- Providing average templates of three rhythm leads in every stage to observe the change of ST segments between every two stages
- Automatically forming elaborate reports, including Summary Report, ST Scope Report and Trend Graph Report
- Providing classical exercise protocols; exercise protocols can be edited and created
- Automatically controlling and adjusting the speed and grade of the treadmill or the power of the ergometer
- Supporting multi-types of treadmill or ergometer

Chapter 3 About the Electrocardiograph Application

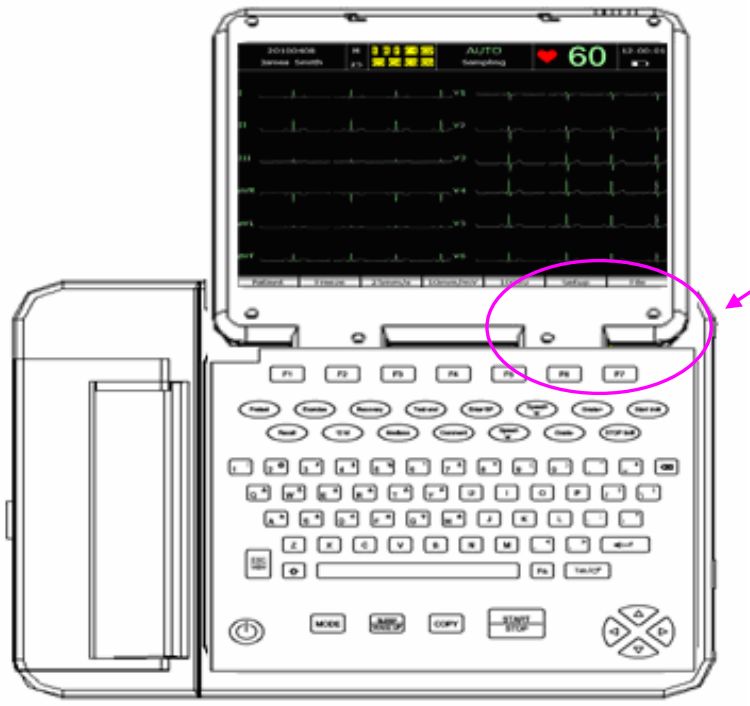
The following sections provide an overview of the main operations and functions.

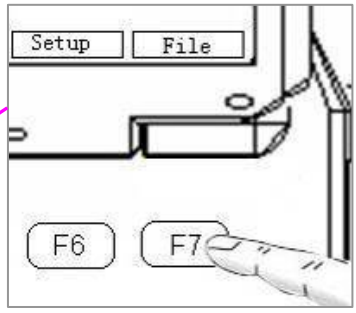
You can operate the electrocardiograph by using the keyboard. For SE-12 Express, you can also carry out the operations by using the touch screen.

CAUTION

Do not touch the LCD screen with sharp things such as pencils or pens; otherwise, it will be damaged.

3.1 Selecting Menu Functions



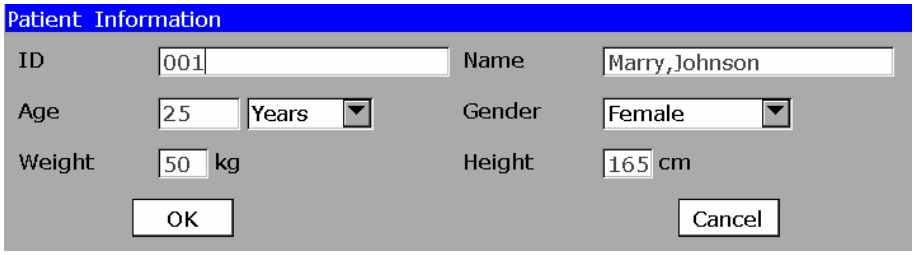


Press **F7** below **File** to select **File** and open the **File Manager** screen.

To select **Patient**, press the function key **F1** below **Patient**.

To select **Setup**, press the function key **F6** below **Setup**.

3.2 Entering Data

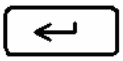
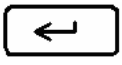


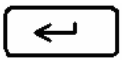
1. When the main screen is displayed, press the function key **F1** below **Patient** to open the **Patient Information** window.

2. Press **Tab** or Shift + **Tab** to move the cursor to the **Name** textbox.

3. Press on the keyboard to erase the typed information.

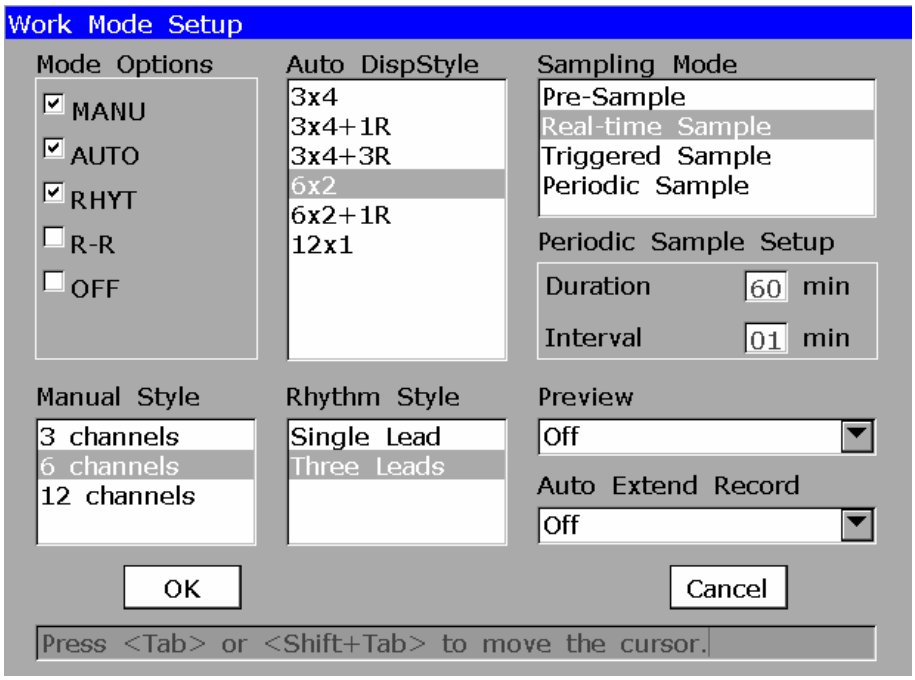
4. Press the letter or number keys on the keyboard to input patient name. Press **Fn** and a letter key to input the special character in the top right corner of the key. Press Shift and a number key to input the special character in the top right corner of the key. For example, press **Fn** + **a** to input **è**, and press Shift + **3** to input **#**. If **Caps Lock** is set to **Off**, pressing Shift and a letter key can input a capital letter. If **Caps Lock** is set to **On**, pressing Shift and a letter key can input a lowercase letter.

5. Press  to confirm, or press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press  to confirm.

6. Press **ESC** to cancel the operation, or press **Tab** or Shift + **Tab** to move the cursor to the **Cancel** button, and then press  to cancel the operation.

3.3 Selecting an Item

When the main screen is displayed, press the function key **F6** below **Setup** to open the **System Setup** window. The cursor is on **Work Mode**. Press ↵ to open the **Work Mode Setup window**.



1. Press **Tab** or Shift + **Tab** to move the cursor to **R-R**, press Spacebar to select it, and then a check mark √ appears in the box before **R-R**.

2. Press **Tab** or Shift **+ Tab** to move the cursor to the **Rhythm Style** list box. Press the Up or Down arrow to highlight **Single Lead** or **Three Leads**.

3. Press ↵ to confirm, or press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press ↵ to confirm.

4. Press **ESC** to cancel the operation, or press **Tab** or Shift + **Tab** to move the cursor to the **Cancel** button, and then press ↵ to cancel the operation.

3.4 About the main screen

After you turn on the device, the main screen pops up.

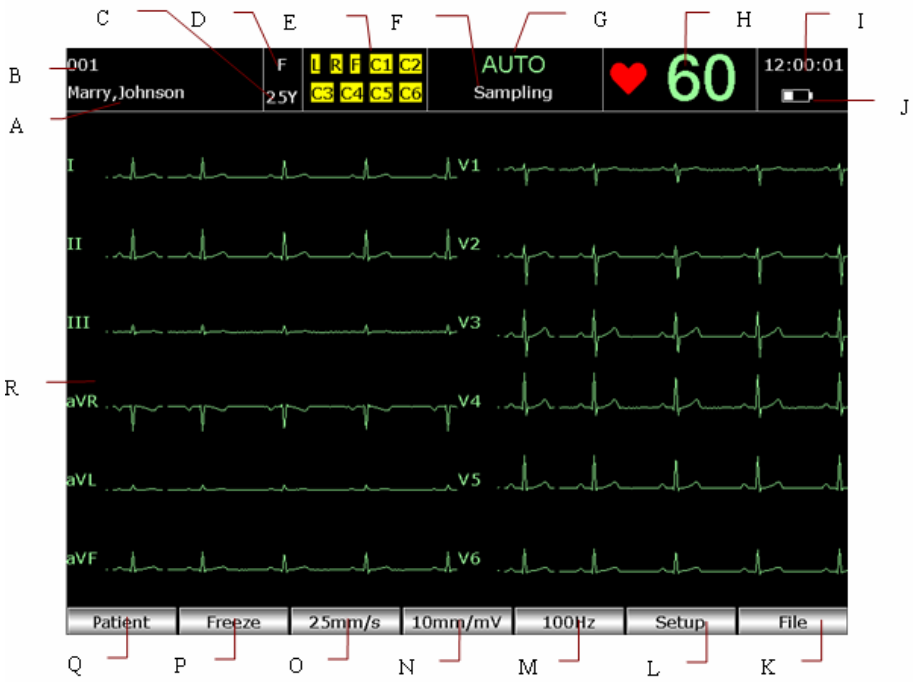


Figure 3-1 SE-12 Express Main Screen

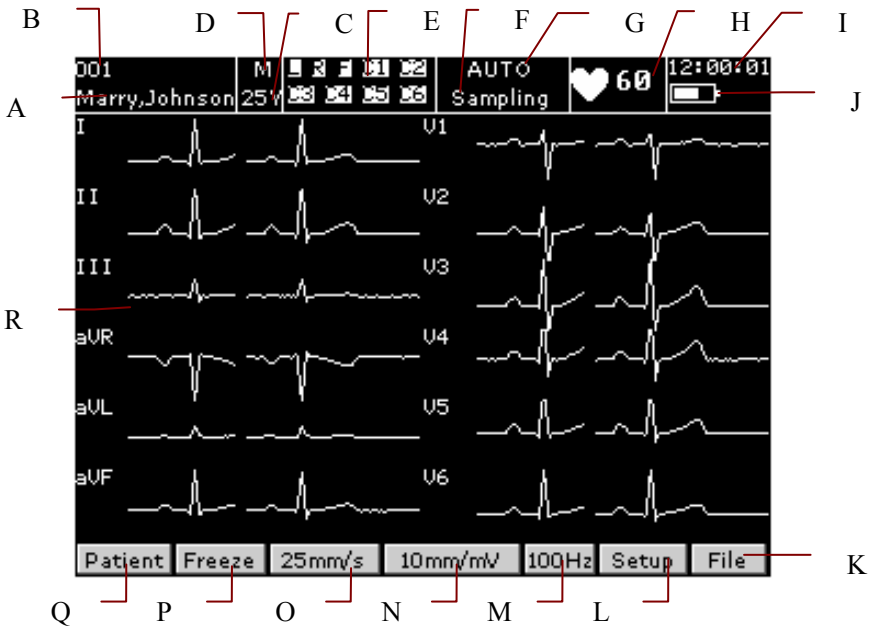


Figure 3-2 SE-12 Main Screen

	Name	Explanation
A	Name	Patient Name: within 60 ASCII characters or the equivalent number of other characters that can be supported by equivalent memory used by 60 ASCII characters
B	ID	When **ID Mode** is set to **Manual**, the patient ID is within 30 ASCII characters. When **ID Mode** is set to **Auto**, the patient ID is 0~1999, 999, 999. When **ID Mode** is set to **Time**, the patient ID is within 10 characters.
C	Age	Patient Age The patient age value and the age unit can be set in the **Patient Information** window.
D	Gender	Patient Gender (Male/Female/Empty)
E	Hint Information 1	Including *DEMO*, *Module Error*, *Overload*, Lead Name (When the leads are off, the lead names will be shown in black on a yellow background in SE-12 Express, while in SE-12, they will be shown in black on a white background.)
F	Hint Information 2	Including *No Paper*, *Paper Error*, *Battery Weak*, *Sampling*, *Analyzing*, *Recording*, *Testing, Learning*, *Transmitting*, *Transmit Fail*, *Detecting*, *Memory Full*, *U Disk*, *USB Printer*, *Lead Off*, *USB Scanner*
G	Work Mode	Manual, Auto, Rhythm, R-R Analysis or Off
H	Heart Rate	Actual Heart Rate
I	Current Time	Current examination time. Refer to Section 11.8.1, “Setting Date and Time”.
J	Battery Symbol	Identify the current capacity of the battery
K	File	Press the function key **F7** below **File** to open the **File Manager screen**. For details, please refer to Chapter 10, “Managing Files”.
L	Setup	Press the function key **F6** below **Setup** to display the **System Setup screen**. For details, please refer to Chapter 11, “System Setup”.
M	Filter	EMG Filter: 25Hz, 35Hz or 45Hz Lowpass Filter: 75Hz, 100Hz or 150Hz **NOTE**: This setup can’t be saved if it is modified on the main screen.

N	Gain	Gain: 2.5 mm/mV, 5 mm/mV, 10 mm/mV, 20 mm/mV, 10/5 mm/mV or AGC **NOTE**: This setup can't be saved if it is modified on the main screen.
O	Speed	In the manual mode, you can set **Speed** to **5mm/s**, **6.25mm/s**, **10mm/s**, **12.5mm/s**, **25mm/s** or **50mm/s**. In the auto and rhythm modes, only **25mm/s** and **50mm/s** are available. In the R-R analysis mode, only **25mm/s** is available. **NOTE**: This setup can't be saved if it is modified on the main screen.
P	Freeze	Freezing ECG waves. For details, please refer to Chapter 7, "Freezing ECG Waves".
Q	Patient	Press the function key **F1** below **Patient** to open the **Patient Information** window. For details, please refer to Chapter 6, "Entering Patient Information".
R	ECG waveform	Display ECG waveform

3.5 About the main screen of Exercise ECG (Optional for SE-12 Express)

After turning on the electrocardiograph, press **Pretest** on the keyboard to open the main screen of the exercise test (Figure 3-3). During the exercise test, the main screen of ST Trend (Figure 3-4) or the main screen of Template (Figure 3-5) will appear.

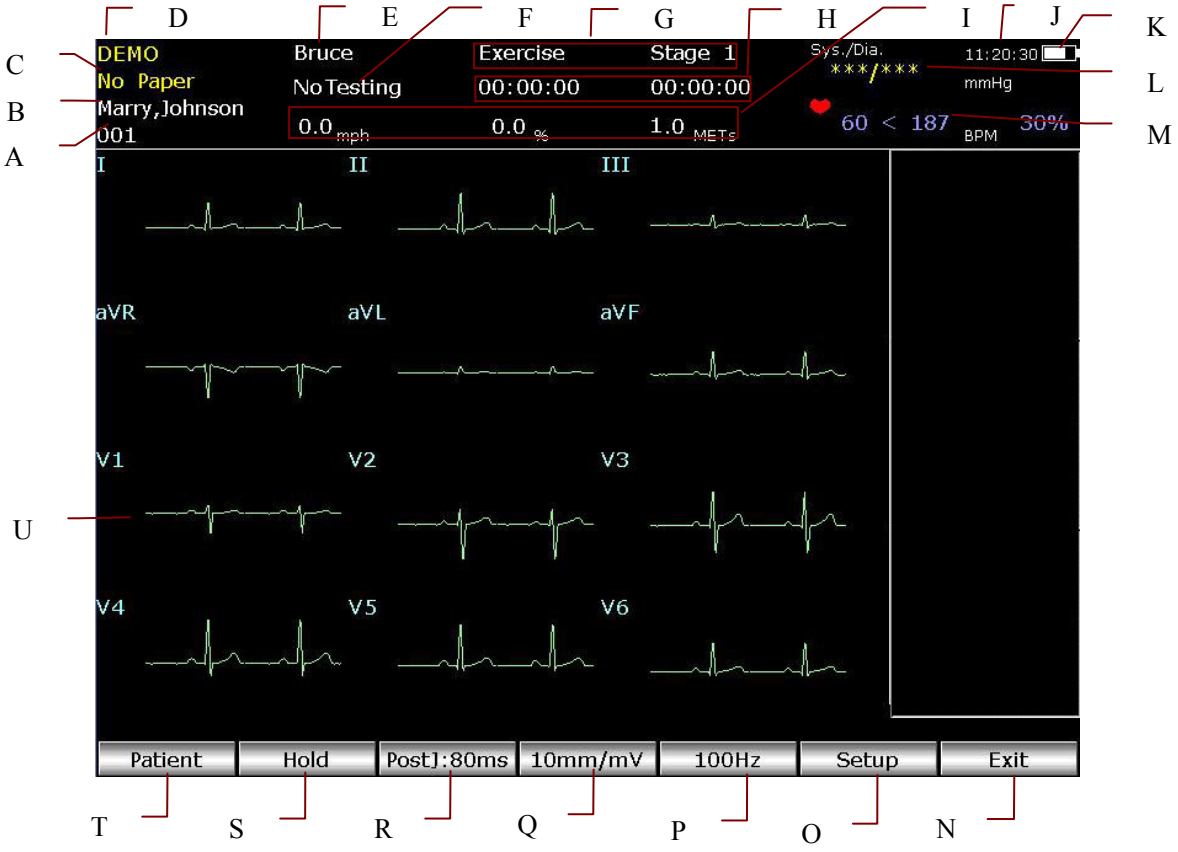


Figure 3-3 Main screen of Exercise Test

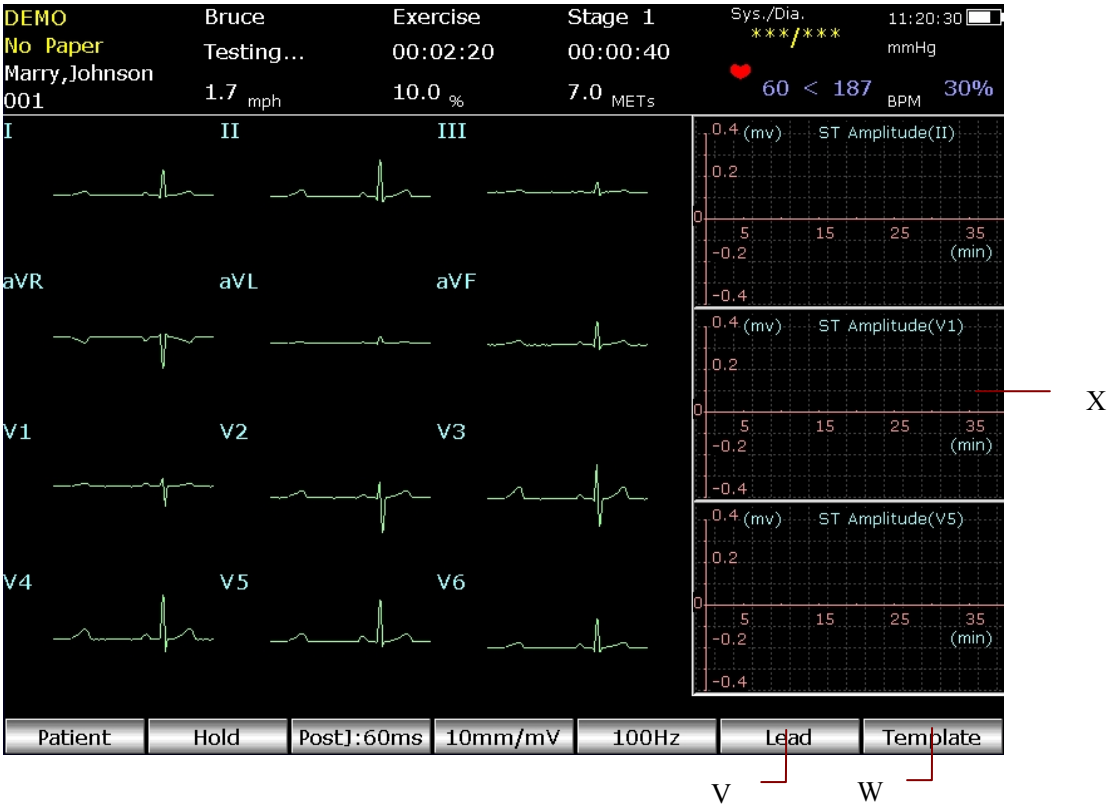


Figure 3-4 Main screen of ST Trend

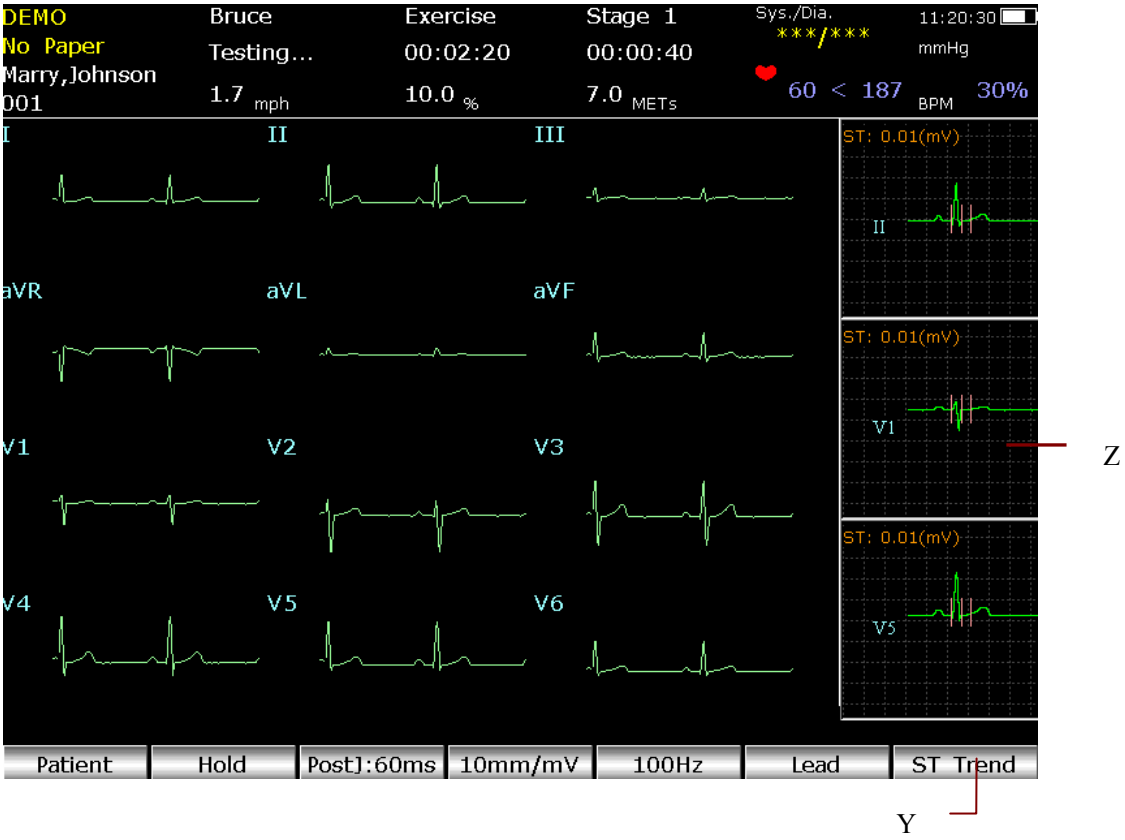


Figure 3-5 Main screen of Template

A	ID	When **ID Mode** is set to **Manual**, the patient ID is within 30 characters. When **ID Mode** is set to **Auto**, the patient ID is 0~1999, 999, 999. When **ID Mode** is set to **Time**, the patient ID is within 10 characters.
B	Name	Patient Name: within 60 ASCII characters or the equivalent number of other characters that can be supported by equivalent memory used by 60 ASCII characters
C	Hint Information1	*HR Overrange!*, *Sys. Overrange!*, *Dia. Overrange!*, *Battery Weak*, *No Paper*, *Paper Error*
D	Hint Information2	*DEMO*, *Module Error*, *Lead X Off*, *Overload*
E	Current Protocol	The selected protocol name
F	Hint Information3	*No Testing*, *Testing…*, *Testing Stop* During the exercise test, the count from 0 to 9 is displayed after the **12ld** key on the keyboard is pressed.
G	Current Phase and Stage	The current phase and stage of the exercise test

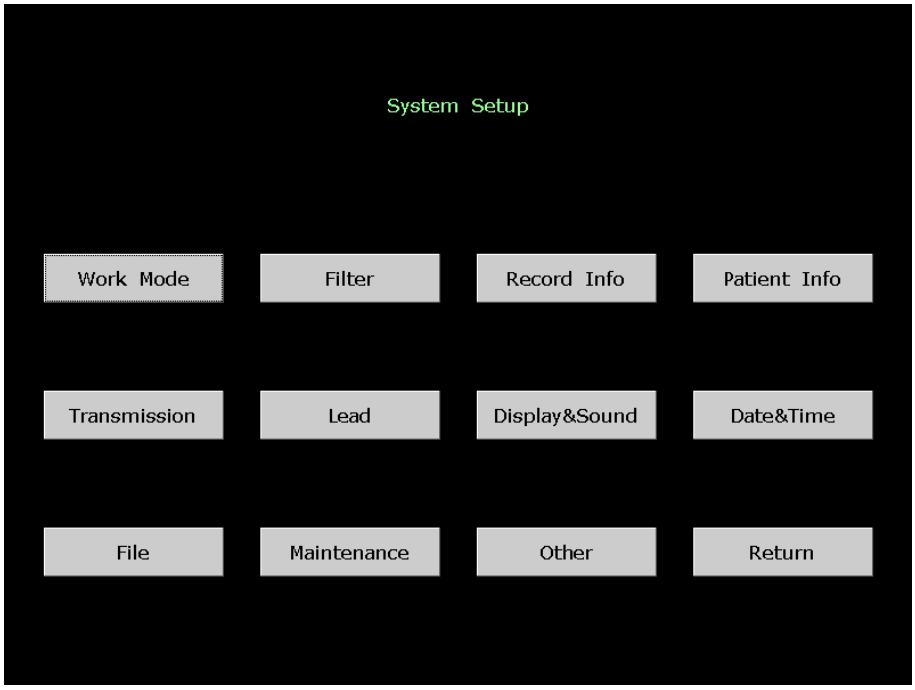
H	Total Time and Stage Time	The left number is the total time, which is counted from the beginning of the pretest phase to the end of the exercise test. The right number is the stage time, which shows the running time of the current stage.
I	Current Speed or Rotation Speed, Grade or Power, Workload	When the treadmill is used, the current speed, grade and workload of the treadmill will be displayed on the main screen; When the ergometer is used, the current rotation speed and power of the ergometer will be displayed on the main screen.
J	Current Time	Current examination time. Refer to Section 11.8.1, "Setting Date and Time".
K	Battery Symbol	Identify the current capacity of the battery : Full capacity; : 2/3 capacity; : 1/3 capacity; : Empty
L	Systolic Blood Pressure and Diastolic Blood Pressure	The left number is the systolic blood pressure, and the right number is the diastolic blood pressure.
M	Current Heart Rate and Target Heart Rate	The left number is the current heart rate, and the right number is the target heart rate. **30%** is the percentage of the current heart rate to the target heart rate.
N	Exit	Press the function key **F7** below **Exit** to exit the main screen of the exercise test. In the exercise test, the **Exit** button changes into the **ST Trend** or **Template** button.
O	Setup	Press the function key **F6** below **Setup** to open the **System Setup screen**. In the exercise phase, the **Setup** button changes into the **Lead** button.
P	Filter	EMG Filter: 25Hz, 35Hz or 45Hz Lowpass Filter: 75Hz, 100Hz or 150Hz
Q	Gain	Gain: 2.5 mm/mV, 5 mm/mV, 10 mm/mV, 20 mm/mV, 10/5 mm/mV or AGC
R	Post J: 80ms	Post J is the length after J point of ST segment. Press the function key **F3** below **Post J** to set Post J to 0, 20ms, 40ms, 60ms or 80ms. **NOTE**: J point is the connection point between the end of QRS complex and the start of ST segment. It is the standard point to fix the position of ST segment.

		Please select a proper option based on the patient's actual ECG waves.
S	Hold	Press the function key **F2** below **Hold**, and then the system will not follow the previous settings to change the speed and grade of the treadmill, but keep the current speed and grade until this key is pressed again.
T	Patient	Press the function key **F1** below **Patient** to open the **Patient Information** window. It is invalid in the exercise test.
U	ECG waveforms	Display real-time ECG waveforms.
V	Lead	Press the function key **F6** below **Lead** to open the **Lead Setup window**.
W	Template Button	Press the function key **F7** below **Template**, and then the 3-lead average templates will be displayed, and the **Template** button will change into the **ST Trend** button.
X	ST Trend	Display 3-lead ST trends.
Y	ST Trend Button	Press the function key **F7** below **ST Trend**, and then the 3-lead ST trends will be displayed, and the **ST Trend** button will change into the **Template** button.
Z	Average Template	The 3-lead average waves which are updated every 10 seconds, and the positions of the calibration lines. The 3 leads can be selected in the Lead Setup window of the exercise test.

3.6 About the System Setup screen

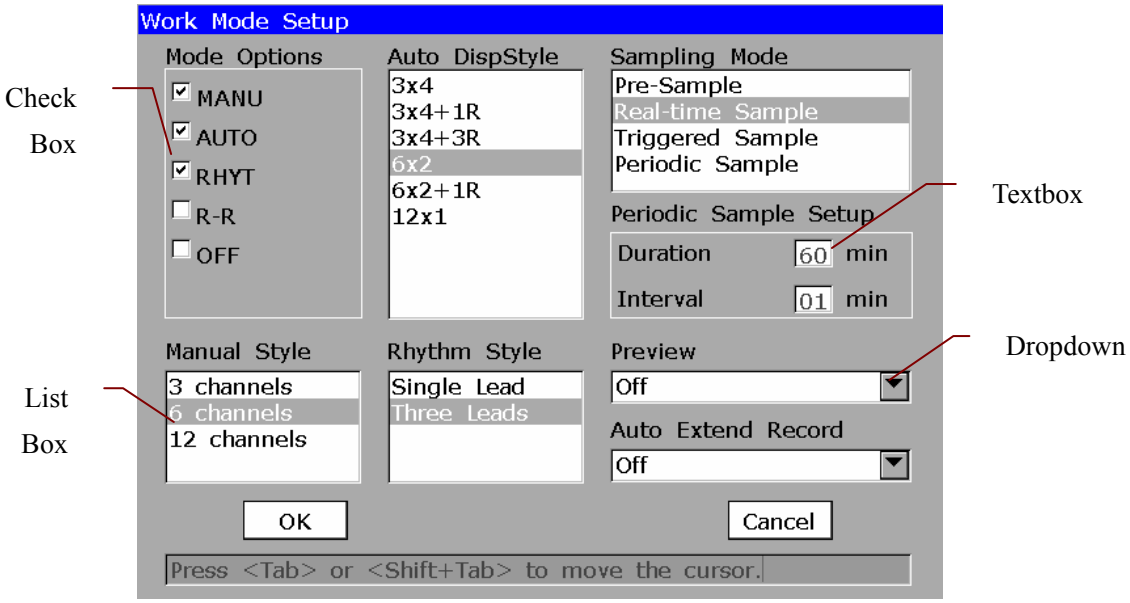
When the main screen is displayed, press the function key **F6** below **Setup** to display the **System Setup screen**.

NOTE: If you set the system password in the System Maintenance window, you need enter the password before opening the **System Setup screen**. For details, refer to Section 11.10.7, "Setting System Password".



On the **System Setup screen**, press **Tab** or Shift + **Tab**, or the Up, Down, Left or Right arrow to move the cursor. When the cursor is on an item, press ↵ to open the setup window of the item.

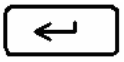
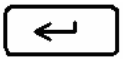
Take the **Work Mode Setup window** for example:

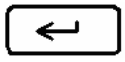


1. In the Work Mode Setup window, press **Tab** or Shift + **Tab** to move the cursor among different check boxes. Press Spacebar to select a check box, and a check mark √ appears in the box.

2. In the Work Mode Setup window, press **Tab** or Shift **+ Tab** to move the cursor to a list box or dropdown. Press the Up or Down arrow to highlight an option.

3. In the Work Mode Setup window, press **Tab** or Shift + **Tab** to move the cursor to a textbox. Fill in the selected textbox.

4. Press  to confirm, or press **Tab** or Shift **+ Tab** to move the cursor to the **OK** button, and then press  to confirm.

5. Press **ESC** to cancel the operation, or press **Tab** or Shift **+ Tab** to move the cursor to the **Cancel** button, and then press  to cancel the operation.

3.7 About the File Manager screen

When the main screen is displayed, press the function key **F7** below **File** to open the **File Manager screen**1. Press the Up or Down arrow to highlight a file on the **File Manager screen**1, and then press the function key **F4** below **Select** to select the file and display the **File Manager screen**2. Then press the function key **F7** below **Return** to return to the **File Manager screen**1. Press the function key **F7** below **Return** on the **File Manager screen**1 to return to the main screen.

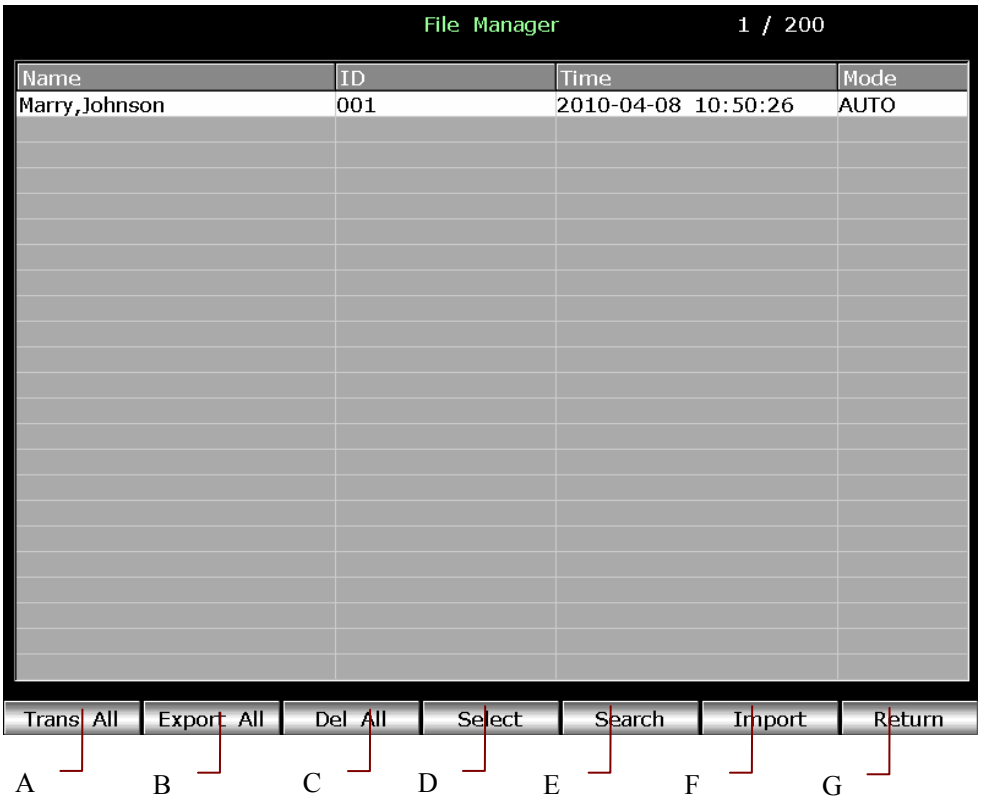


Figure 3-6 File Manager screen1

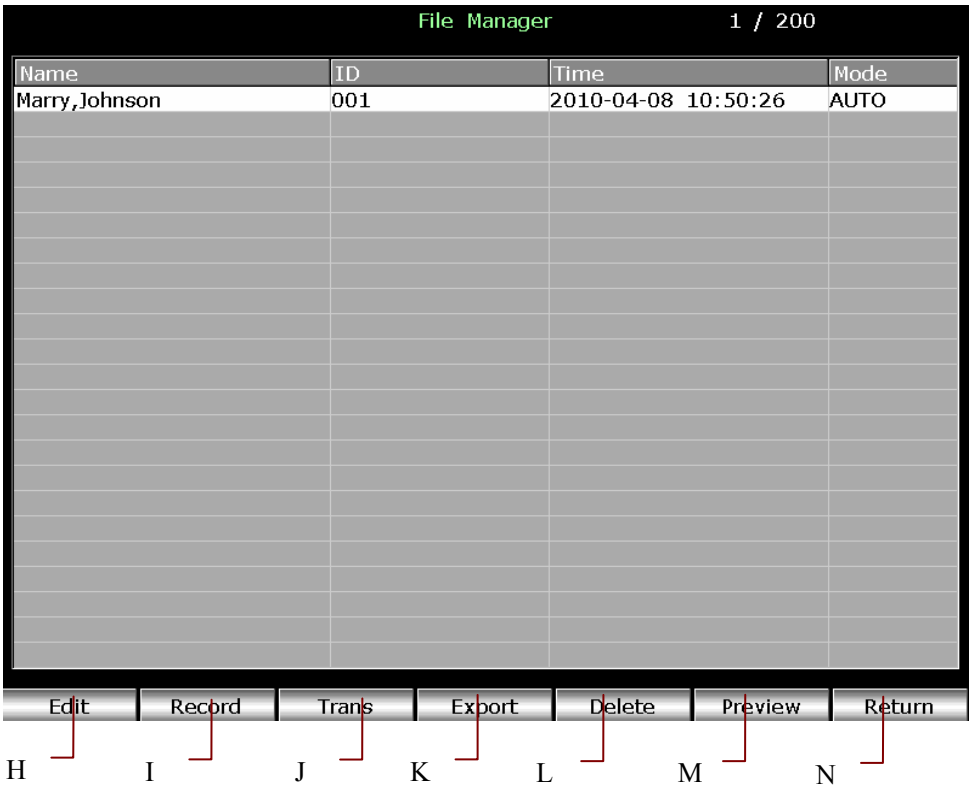


Figure 3-7 File Manager screen2

	Name	Explanation
A	Trans All	Press the function key **F1** below **Trans All** to transmit all the files to the PC.
B	Export All	Press the function key **F2** below **Export All** to export all the files from the electrocardiograph to the U disk.
C	Del All	Press the function key **F3** below **Del All** to delete all the files from the electrocardiograph.
D	Select	Press the Up or Down arrow to highlight a file on the **File Manager screen**1, and then press the function key **F4** below **Select** to select the file and display the **File Manager screen**2.
E	Search	Press the function key **F5** below **Search** to open the **SearchInfo Setup** window.
F	Import	Press the function key **F6** below **Import** to import files from the U disk to the electrocardiograph.
G	Return	Press the function key **F7** below **Return** to return to the main screen.
H	Edit	Press the function key **F1** below **Edit** to open the **Patient Information** window. Then you can edit the patient information.
I	Record	Press the function key **F2** below **Record** to print the selected file.
J	Trans	Press the function key **F3** below **Trans** to transmit the selected file to the PC.
K	Export	Press the function key **F4** below **Export** to export the selected file from the electrocardiograph to the U disk.
L	Delete	Press the function key **F5** below **Delete** to delete the selected file from the electrocardiograph.
M	Preview	Press the function key **F6** below **Preview** to open the file preview screen.
N	Return	Press the function key **F7** below **Return** to return to the **File Manager screen**1.

Chapter 4 Operation Preparations

WARNING

Before use, the equipment, patient cable and electrodes should be checked. Replace them if there is any evident defectiveness or aging which may impair the safety or the performance, and make sure that the equipment is in proper working condition.

4.1 Power and Earthing

WARNING

If the integrity of the external protective conductor is in doubt, the equipment should be powered by battery.

Power Supply

The electrocardiograph can be powered by either the mains supply or battery.

- **Mains Supply**

  The mains socket is on the rear panel of the unit. If the mains supply is used, connect the power cord to the socket first, and then connect the power cord to the hospital grade outlet.

Operating voltage:	100V-240V~
Operating frequency:	50Hz/60Hz
Input current:	0.9-0.4A

  Make sure that the mains supply meets the above requirements before power-on, and then press ⏻ on the keyboard to power on the unit. The mains supply indicator (∿) is lit.

  If the battery is weak when the mains supply is used, it will be recharged automatically at the same time. Both the mains supply indicator (∿) and the battery recharging indicator (⇥▭) will be lit.

♦ **Battery**

When the battery is used, turn on the unit by pressing on the keyboard. Then the battery indicator ( ) will be lit and the battery symbol will be displayed on the LCD screen. Because of the consumption during the storage and transport course, the battery capacity may not be full. If the symbol and the hint information *Battery Weak* are displayed, which means the battery capacity is low, please recharge the battery first.

CAUTION

1. If the electrocardiograph is turned off automatically because of low battery capacity, the settings may not be saved.
2. If the battery has been fully charged and requires recharging after printing only a few ECGs, consider replacement.
3. The use of electrocardiograph accessories (such as barcode reader) will deplete battery power at a faster rate. The battery will require more frequent charging if these accessories are used with the electrocardiograph.

When the battery is fully charged, SE-12 can work normally about 4 hours, and print about 300 ECG reports of 3×4+1R in the auto mode; SE-12 Express can work normally about 5 hours, and print about 350 ECG reports of 3×4+1R in the auto mode.

Please refer to the maintenance section for how to recharge the battery. When the battery is being recharged, the electrocardiograph can be powered by the mains supply.

WARNING

Potential equalization conductor of the unit should be connected to the potential equalization bus bar of the electrical installation when necessary.

4.2 Loading/Replacing Recorder Paper

Two kinds of recorder paper can be used. One is the folded thermal paper, and the other is the rolled thermal paper.

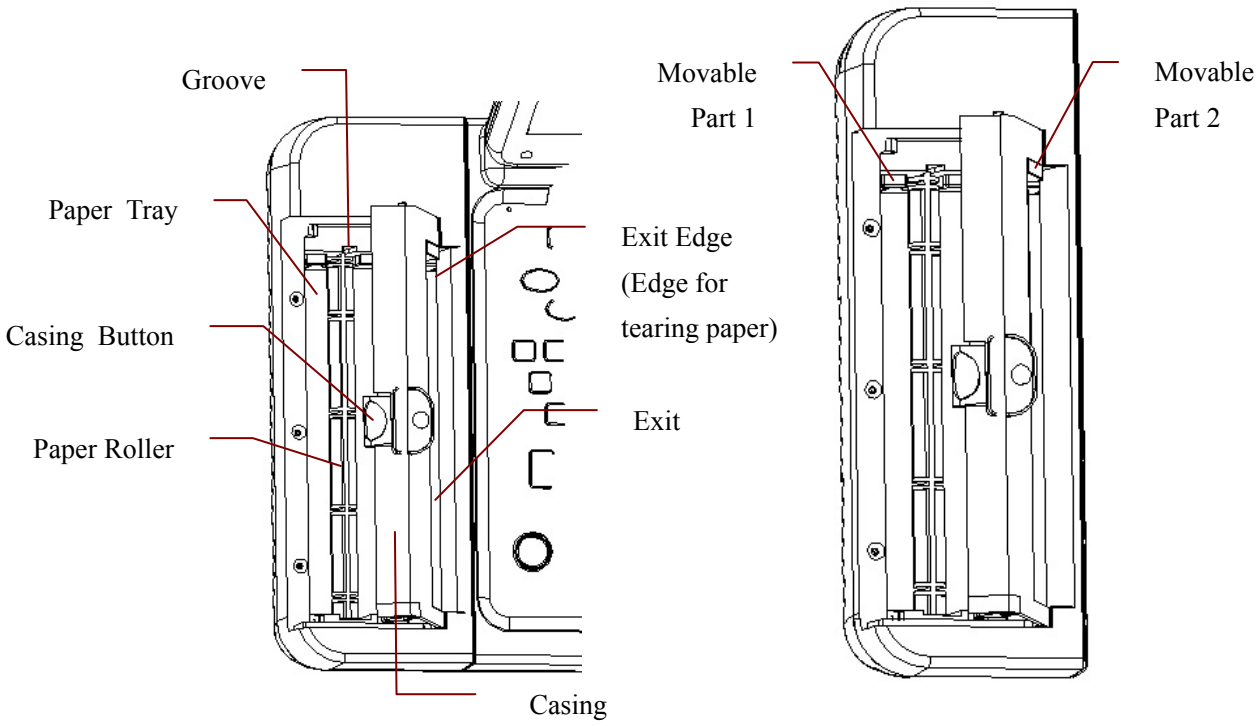
NOTE:

1. When the folded thermal paper is used, the paper roller is unnecessary and must be taken out.
2. When using the paper of 216mm in width, the two movable parts should be removed.
3. The exit edge can help you tear the recorder paper.

CAUTION

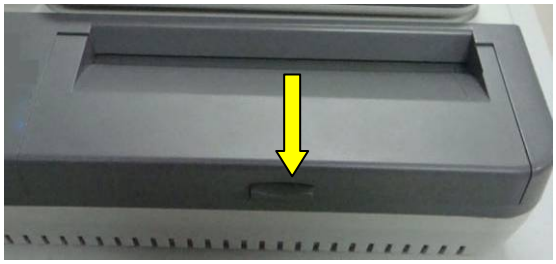
Make sure that the recorder paper, especially the rolled paper, is installed in the center of the recorder, and the paper edge is parallel with the casing edge in the direction of advancing paper, in order to avoid paper deviation or damage to the paper edge.

When the recorder paper runs out or is not loaded, the hint message *No Paper* will appear on the screen. Then you should load or replace the recorder paper immediately.



Loading/Replacing Process of Folded Paper:

1) Press the casing button downwards and remove the casing to open the recorder.



2) Remove the remainder paper from the paper tray if necessary.

3) Take off the wrapper of the new folded paper, and then put it in the paper tray.

4) Pull the paper out with the grid side facing the thermal print head, and replace the casing on the recorder.

5) Press down the recorder casing firmly.

6) To select **Paper Marker**.

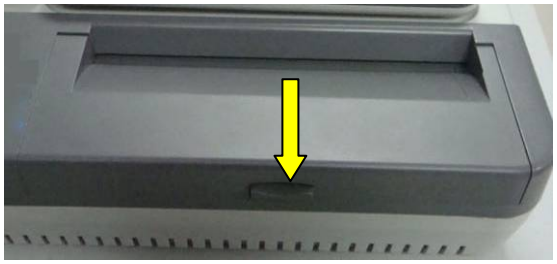
Press ⏻ on the keyboard to turn on the unit. After the main screen is displayed, press the function key **F6** below **Setup** to display the **System Setup screen**. Press **Tab** or Shift + **Tab**, or the Up, Down, Left or Right arrow to move the cursor. When the cursor is on **Record Info** on the **System Setup screen**, press ↵ to open the **Record Info Setup window**. Press **Tab** or Shift + **Tab** to move the cursor to the **Paper Marker** list box, and then press the Up or Down arrow to highlight **No** or **Yes**. Press ↵ to confirm, and then the **System Setup screen** appears. Press **ESC** to return to the main screen.

7) Advance the recorder paper.

When the main screen is displayed, if **Paper Marker** is set to **Yes**, you can press Tab/♂ to advance the recorder paper to the next black marker; if **Paper Marker** is set to **No,** you can press Tab/♂ to advance the paper for 2.5cm. Press Tab/♂ again to stop advancing the paper.

Loading/Replacing Process of Rolled Paper:

1) Press the casing button downwards and remove the casing to open the recorder.



2) Take out the paper roller, and remove remainder paper from the roller if necessary.

3) Take off the wrapper of the new thermal paper roll, and then put the paper roll through the roller.

4) Place the paper and the roller gently in the recorder with the roller pin clicking into the groove.

5) Pull the paper out with the grid side facing the thermal print head, and replace the casing on the recorder.

6) Press down the recorder casing firmly.

7) To select **Paper Marker**.

Press ⏻ on the keyboard to turn on the unit. After the main screen is displayed, press the function key **F6** below **Setup** to display the **System Setup screen**. Press **Tab** or Shift + **Tab**, or the Up, Down, Left or Right arrow to move the cursor. When the cursor is on **Record Info** on the **System Setup screen**, press ↵ to open the **Record Info Setup window**. Press **Tab** or Shift + **Tab** to move the cursor to the **Paper Marker** list box, and then press the Up or Down arrow to highlight **No**. Press ↵ to confirm, and then the **System Setup screen** appears. Press **ESC** to return to the main screen.

8) Advance the recorder paper.

When the main screen is displayed, you can press Tab/♂ to advance the paper for 2.5cm. Press Tab/♂ again to stop advancing the paper.

4.3 Preparing the Patient

4.3.1 Instructing the Patient

Before attaching the electrodes, greet the patient and explain the procedure. Explaining the procedure decreases the patient's anxiety. Reassure the patient that the procedure is painless. Privacy is important for relaxation. When possible, prepare the patient in a quiet room or area where others can't see the patient. Make sure that the patient is comfortable. The more relaxed the patient is, the less the ECG will be affected by noise.

4.3.2 Preparing the Skin

Thorough skin preparation is very important. The skin is a poor conductor of electricity and frequently creates artifacts that distort the ECG signals. By performing methodical skin preparation, you can greatly reduce the possibility of noise caused by muscle tremor and baseline drift, ensuring high-quality ECG waves. There is natural resistance on the skin surface due to dry, dead epidermal cells, oils and dirt.

To Prepare the Skin

1. 1 Shave hair from electrode sites, if necessary. Excessive hair prevents a good connection.
2. Wash the area thoroughly with soap and water.
3. Dry the skin with a gauze pad to increase capillary blood flow to the tissues and to remove the dead, dry skin cells and oils.

4.4 Connecting the Patient Cable to the Electrocardiograph and Electrodes

WARNING

The performance and electric shock protection can be guaranteed only if the original patient cable and electrodes of the manufacturer are used.

The patient cable includes the main cable and lead wires which can be connected to electrodes.

Patient Cable for Resting ECG

Patient Cable for Exercise ECG

1. Connecting the Patient Cable to the Electrocardiograph

Connect the patient cable to the patient cable socket on the right side of the main unit, and then secure them with two screws.

2. Connecting the Patient Cable to Electrodes

Align all lead wires of the patient cable to avoid twisting, and connect the lead wires to the reusable electrodes or the alligator clips. Firmly attach them.

4.5 Attaching Electrodes to the Patient (for Resting ECG)

4.5.1 Lead Placement

4.5.1.1 Standard 12-Lead Placement

The identifiers and color codes of electrode connectors used comply with IEC/EN requirements. In order to avoid incorrect connection, the identifiers and color codes are specified in Table 4-1. Moreover the equivalent codes according to European requirements are given in Table 4-1 too.

Table 4-1 Electrode Connectors and Their Identifiers and Color Codes

	European		American	
Electrode Connectors	**Identifier**	**Color Code**	**Identifier**	**Color Code**
Right arm/Right deltoid	R	Red	RA	White
Left arm/Left deltoid	L	Yellow	LA	Black
Right leg/Upper leg as close to torso as possible	N or RF	Black	RL	Green
Left leg/Upper leg as close to torso as possible	F	Green	LL	Red
Chest 1	C1	White/Red	V1	Brown/Red
Chest 2	C2	White/Yellow	V2	Brown/Yellow
Chest 3	C3	White/Green	V3	Brown/Green
Chest 4	C4	White/Brown	V4	Brown/Blue

Chest 5	C5	White/Black	V5	Brown/Orange
Chest 6	C6	White/Violet	V6	Brown/Violet

As the following figure shows, the positions of chest electrodes on the body surface are

C1: Fourth intercostal space at the right border of the sternum

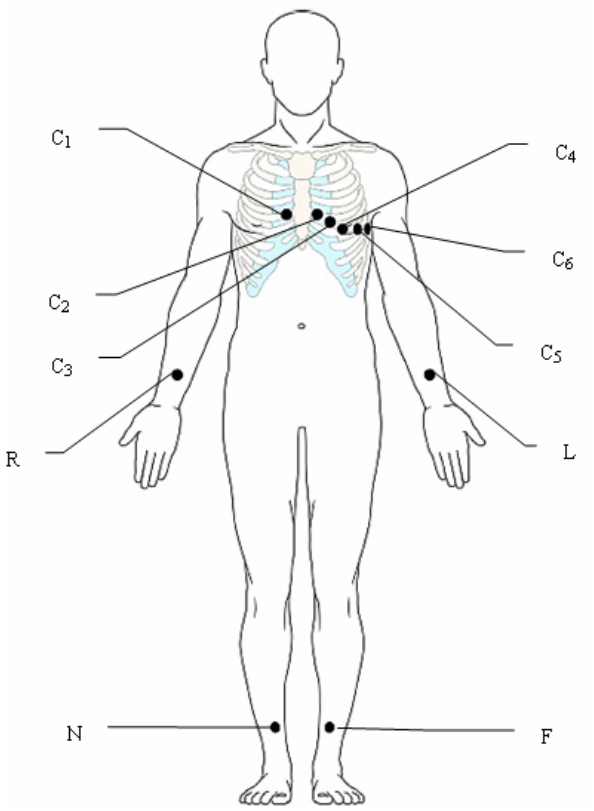
C2: Fourth intercostal space at the left border of the sternum

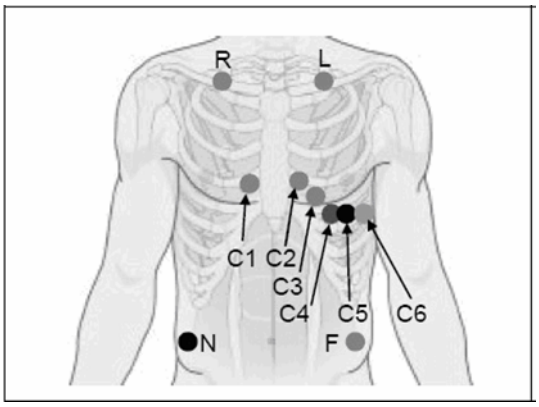
C3: Fifth rib between C2 and C4

C4: Fifth intercostal space on the left midclavicular line

C5: Left anterior axillary line at the horizontal level of C4

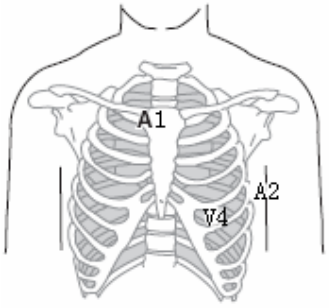
C6: Left midaxillary line at the horizontal level of C4





4.5.1.2 NEHB Placement

The electrodes' positions on the body surface are shown in the following table and figure.



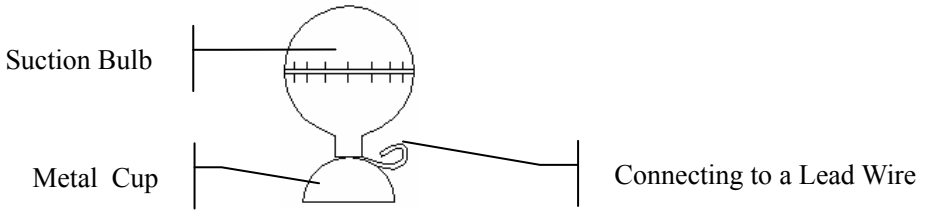
American Label	European Label	Electrode Placement
A1	N_{st}	Attachment point of the second rib to the right sternal edge
A2	N_{ax}	Fifth intercostal space on the left posterior axillary line
V4	N_{ap}	Left mid-clavicular line in the fifth intercostal space
RA	R	Right arm
LA	L	Left arm
RL	N or RF	Right leg
LL	F	Left leg

4.5.2 Electrode Placement

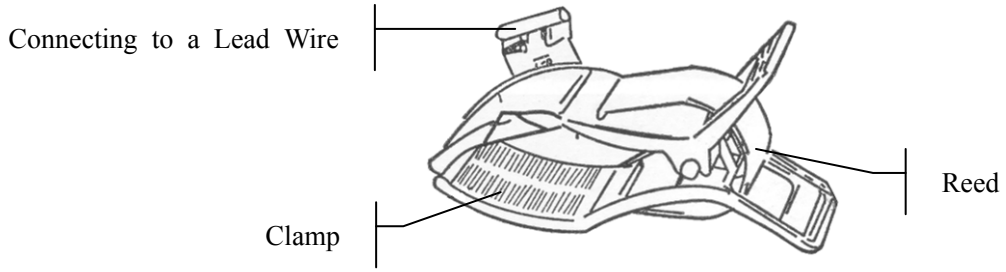
Two kinds of electrode can be used, one is the reusable electrode, and the other is the disposable electrode.

4.5.2.1 Reusable Electrodes

Reusable electrodes include limb electrodes and chest electrodes, as the following figures show.



Chest Electrode



Limb Electrode

Chest Electrode Connection:

1) Ensure that the electrodes are clean;
2) Align all lead wires of the patient cable to avoid twisting, and connect the lead wires to the corresponding electrodes according to the colors and identifiers;
3) Clean the electrode area on the chest surface with 75% alcohol;
4) Daub the round area of 25mm in diameter on each electrode site with gel evenly;
5) Place a small amount of gel on the brim of the chest electrode's metal cup;
6) Place the electrode on the chest electrode site and squeeze the suction bulb. Unclench it and the electrode is adsorbed on the chest;
7) Attach all chest electrodes in the same way.

NOTE: Long-time measurement with a strong negative pressure on the suction bulb may cause reddening of the skin. When using the electrode on small children or patients with delicate skin, squeeze the suction ball lightly.

Limb Electrode Connection:

1) Ensure that the electrodes are clean;
2) Align all lead wires of the patient cable to avoid twisting, and connect the lead wires to the corresponding electrodes according to the colors and identifiers;
3) Clean the electrode area which is a short distance above the ankle or the wrist with 75% alcohol;
4) Daub the electrode area on the limb with gel evenly;
5) Place a small amount of gel on the metal part of the limb electrode clamp;
6) Connect the electrode to the limb, and make sure that the metal part is placed on the electrode area above the ankle or the wrist;
7) Attach all limb electrodes in the same way.

4.5.2.2 Disposable Electrodes

CAUTION

The disposable electrodes can only be used for one time.

Disposable Electrode **Alligator Clip**

Disposable electrodes must be used together with alligator clips.

Disposable Electrode Connection

1) Align all lead wires of the patient cable to avoid twisting, and connect the alligator clips to the lead wires.
2) Clean the electrode areas on the body surface with 75% alcohol.
3) Attach the disposable electrodes to the electrode positions on the body surface.
4) Clip the disposable electrodes with the alligator clips.

The quality of ECG waveform will be affected by the contact resistance between the patient and the electrode. In order to get a high-quality ECG, the skin-electrode resistance must be minimized while connecting electrodes.

WARNING

1. Make sure that all electrodes are connected to the patient correctly before operation.
2. Ensure that the conductive parts of electrodes and associated connectors, including neutral electrodes, do not come in contact with earth or any other conducting objects.

4.6 Attaching Electrodes to the Patient (for Exercise ECG)

The identifiers and color codes of electrodes used comply with IEC/EN requirements. In order to avoid incorrect connections, the electrode identifiers and color codes are specified in Table 4-2. Moreover the equivalent codes according to American requirements are given in Table 4-2 too.

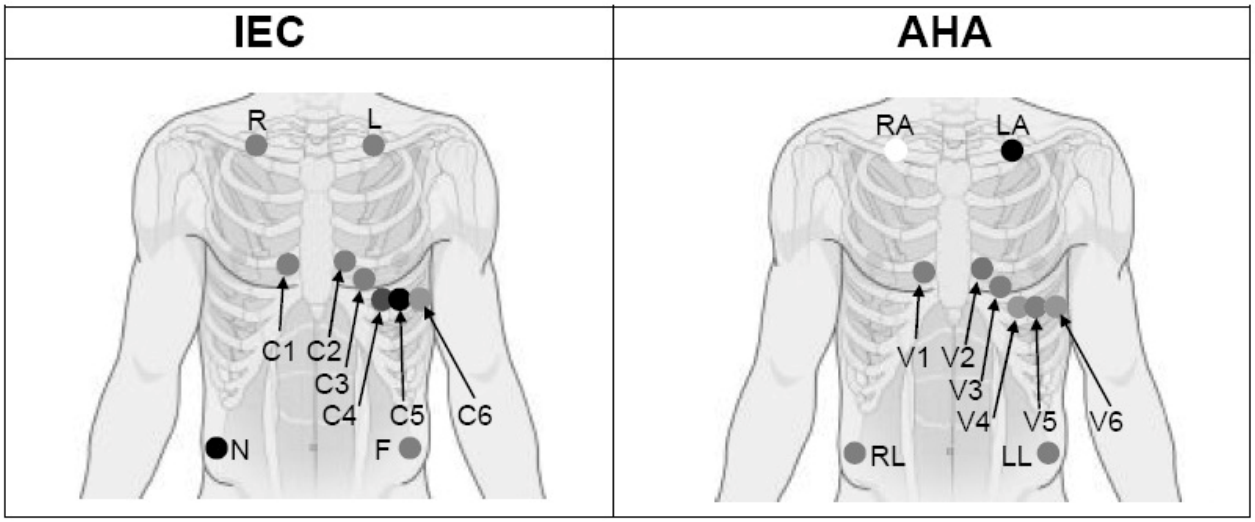


Table 4-2 Electrodes and Their Identifiers and Color Codes

European		American	
Electrodes	**Color Code**	**Electrodes**	**Color Code**
R	Red	RA	White
L	Yellow	LA	Black
N or RF	Black	RL	Green
F	Green	LL	Red
C1	White/Red	V1	Brown/Red
C2	White/Yellow	V2	Brown/Yellow
C3	White/Green	V3	Brown/Green
C4	White/Brown	V4	Brown/Blue
C5	White/Black	V5	Brown/Orange
C6	White/Violet	V6	Brown/Violet

The Precordial Electrodes' Positions on Body Surface:

C1: Fourth intercostal space at the right border of the sternum

C2: Fourth intercostal space at the left border of the sternum

C3: Fifth rib between C2 and C4

C4: Fifth intercostal space on the left midclavicular line

C5: Left anterior axillary line at the horizontal level of C4

C6: Left midaxillary line at the horizontal level of C4

The Extremity Electrodes' Positions on Body Surface:

R/L: below the right/left clavicle

N/F: below the right/left rib

The quality of ECG waveform will be affected by the contact resistance between the patient and the electrode. In order to get a high-quality ECG, the skin-electrode resistance must be minimized while connecting electrodes.

Electrodes Connection:

1) Align all lead wires of the patient cable to avoid twisting, and connect the disposable electrodes to the lead wires.

2) Clean the electrode areas on the body surface with 75% alcohol.

3) Attach the disposable electrodes to the electrode sites.

NOTE: The quality and the placement of the electrode will directly influence the quality of exercise ECG. The wrong placement and use of electrodes will cause incorrect analysis results.

WARNING

1. Make sure that all electrodes are connected to the patient correctly before operation.
2. Ensure that the conductive parts of electrodes and associated connectors, including neutral electrodes, do not come in contact with earth or any other conducting objects.

CAUTION

The disposable electrodes can only be used for one time.

4.7 Inspection before Power-On

In order to avoid safety hazards and get good ECG records, the following inspection procedure is recommended before power-on and operation.

1) **Environment**:
   - ♦ Make sure that there is no electromagnetic interference source around the equipment, especially large medical electrical equipment such as electrosurgical equipment, radiological equipment, magnetic resonance imaging equipment etc. Turn off these devices when necessary.
   - ♦ Keep the examination room warm to avoid muscle tremor voltages in ECG signals caused by cold.
2) **Power Supply**:
   - ♦ If the mains supply is used, please check whether the power cord is connected to the unit well. The grounded three-slot outlet should be used.
   - ♦ When the battery capacity is low, recharge the battery before use.
3) **Patient Cable**:
   - ♦ Make sure that the patient cable is connected to the unit firmly, and keep it far away from the power cord.
4) **Electrodes**:
   - ♦ Make sure that all electrodes are connected to lead wires of the patient cable correctly.
   - ♦ Ensure that the chest electrodes do not contact.
5) **Recorder Paper**:
   - ♦ Ensure that there is enough recorder paper loaded correctly.
6) **Patient**:
   - ♦ The patient should not come into contact with conducting objects such as earth, metal parts etc.
   - ♦ Ensure that the patient is warm and relaxed, and breathes calmly.

WARNING

The electrocardiograph is intended to be used by qualified physicians or personnel professionally trained, and they should be familiar with the contents of this user manual before operation.

Chapter 5 Turning on the Electrocardiograph

- When the mains supply is used, connect the power cord, and the mains supply indicator (∿) is lit. Then press ⏻ on the keyboard to turn on the unit. The logo will be displayed on the LCD screen after self-test. Then the electrocardiograph is ready for use.

- When battery is used, press ⏻ on the keyboard directly to turn on the unit, and then the battery indicator (▭) is lit. The logo will be displayed on the LCD screen after self-test. Then the electrocardiograph is ready for use.

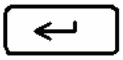
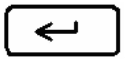
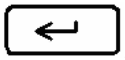
Chapter 6 Entering Patient Information

After the electrocardiograph is turned on, the main screen appears. For SE-12 Express, pressing the **Pretest** key can open the main screen of the exercise test.

6.1 Entering Patient ID

1. By default, the system generates the patient ID automatically. The range of the patient ID is 0 ~ 1999, 999, 999.
2. Or the system can generate the patient ID according to the time when you press the **START/STOP** key to print an ECG report.

The procedures are as follows:

1) Press the function key **F6** below **Setup** to open the **System Setup screen**.
2) Press **Tab** or Shift + **Tab**, or the Up, Down, Left or Right arrow to move the cursor. When the cursor is on **Patient Info**, press  .
3) Press **Tab** or Shift + **Tab** to move the cursor to **ID Mode**, and then press the Up or Down arrow to select **Time**.
4) Press  , or press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press  .
5) Press **ESC** to return to the main screen.

Then the system will generate the patient ID according to the time when you press the **START/STOP** key to print an ECG report.

3. Or you can enter the patient ID manually.

The procedures are as follows:

1) Press the function key **F6** below **Setup** to open the **System Setup screen**.
2) Press **Tab** or Shift + **Tab**, or the Up, Down, Left or Right arrow to move the cursor. When the cursor is on **Patient Info**, press .

3) Press **Tab** or Shift + **Tab** to move the cursor to **ID Mode**, and then press the Up or Down arrow to select **Manual**.

4) Press ↵, or press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press ↵.

5) Press **ESC** to return to the main screen.

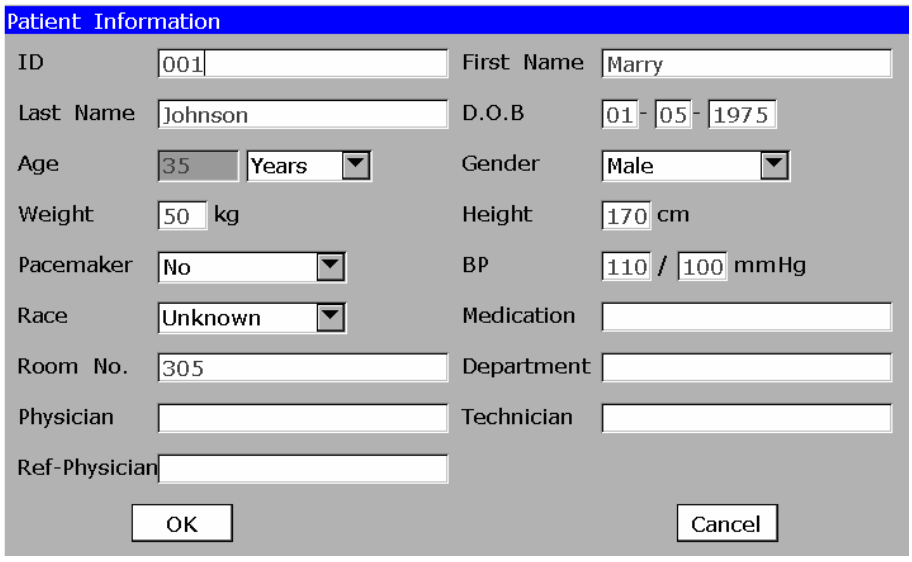
6) Press the function key **F1** below **Patient** to open the **Patient Information** window. Press **Tab** or Shift + **Tab** to move the cursor. When the cursor is in the **ID** textbox, enter the patient ID manually.

7) Press ↵, or press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press ↵.

NOTE: In the auto, rhythm or off mode, when **ID Mode** is set to **Manual** and **ID Hint** is set to **On**, if you do not input the patient ID before pressing the **START/STOP** key, a hint will pop up to remind you to input the patient ID.

6.2 Entering Other Information

When the main screen is displayed, press the function key **F1** below **Patient** to open the **Patient Information** window.



First Name	Within 30 ASCII characters
Last Name	Within 30 ASCII characters
Age	Age Unit: **Years**, **Months**, **Weeks** or **Days**
Gender	Patient Gender (Male/Female/Empty)
Weight (kg)	Patient Weight (Range 0~999)
Height (cm)	Patient Height (Range 0~999)
Pacemaker	If you select **Pacemaker** in the Patient Information Setup window, **Pacemaker** appears in the **Patient Information** window. If **Pacemaker** is set to **Yes**, the pacemaker signals are easy to be detected. If **Pacemaker** is set to **No**, the pacemaker signals are not easy to be detected.
BP (mmHg)	Patient Systolic Blood Pressure/Diastolic Blood Pressure
Race	Patient Race (unknown/ Oriental/ Caucasian/ Black/ Indian/ Mongolian/ Hispanic/ Asian/ Pacific/ other)
Medication	The medication which patient took previously (Within 30 ASCII characters)
Room No.	Room Number (Within 10 ASCII characters)
Department	Within 30 ASCII characters
Physician	Physician Name (Within 35 ASCII characters)
Technician	Technician Name (Within 35 ASCII characters)
Ref-Physician	Referring Physician Name (Within 35 ASCII characters)

NOTE: The total number of supported characters may be fewer if either special Latin characters or Chinese characters are entered.

Operation Procedures are as follows:

1. Press **Tab** or Shift + **Tab** to move the cursor to a textbox. Fill in the selected textbox. For details on inputting data, please refer to Section 3.2, “Entering Data”.
2. Press **Tab** or Shift + **Tab** to move the cursor to a list box. Press the Up or Down arrow to select an option.

3. After inputting all the information, press ↵ to confirm; or press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press ↵ to confirm.

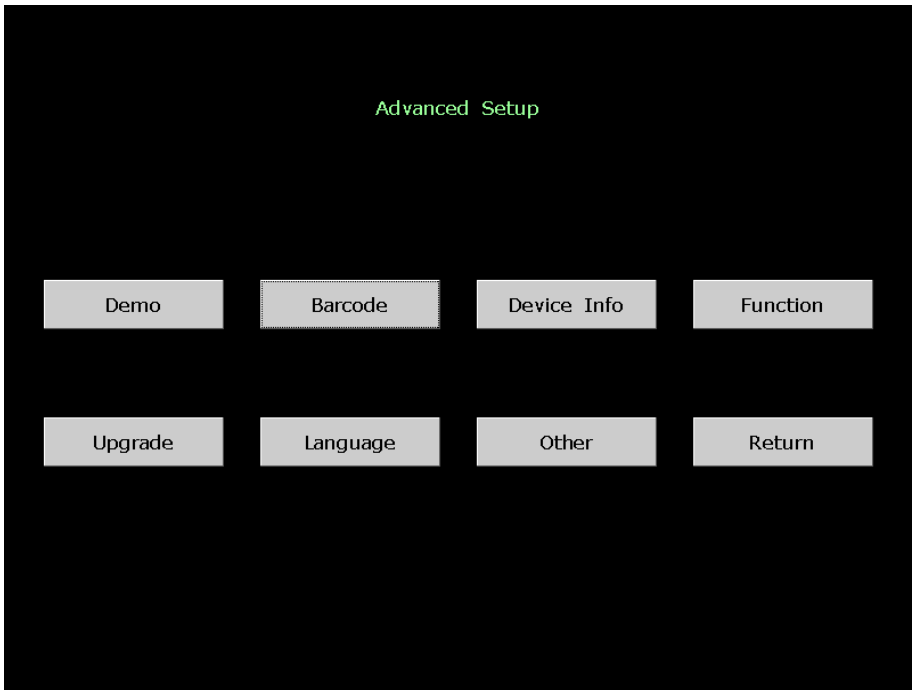
NOTE: If you select **D.O.B** in the Patient Information Setup window, the **D.O.B** textbox appears and the **Age** textbox becomes unavailable in the **Patient Information** window, you can enter the birthday of the patient, and the system will calculate the patient age automatically.

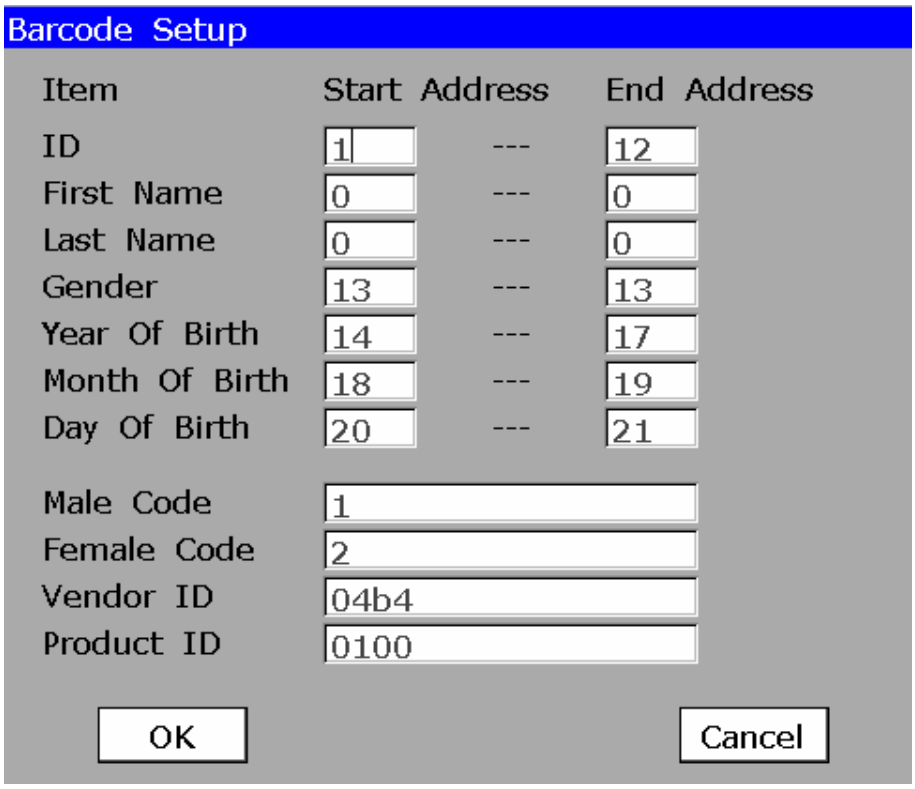
6.3 Using a Bar Code Reader

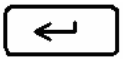
1. Configure the bar code

   1) When the main screen is displayed, press the function key **F6** below **Setup** to open the **System Setup screen**.

   2) Press **F1** to display the **Service Password** window. Then enter the password and press ↵ to open the **Advanced Setup screen** Press **Tab** or Shift + **Tab**, or the Up, Down, Left or Right arrow to move the cursor to **Barcode**, and then press ↵ to open the **Barcode Setup** window.



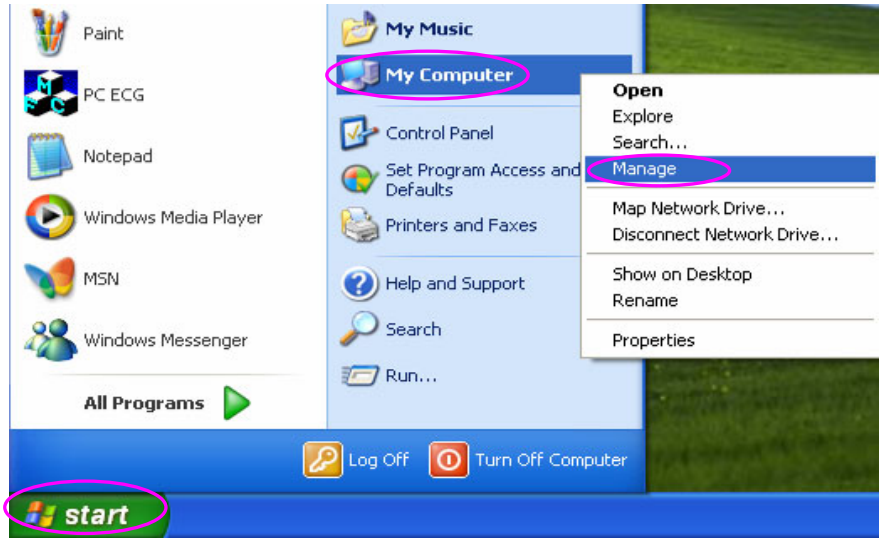


3) Enter the start and end addresses, the male and female codes, the vendor ID and the product ID, and then press  to confirm.

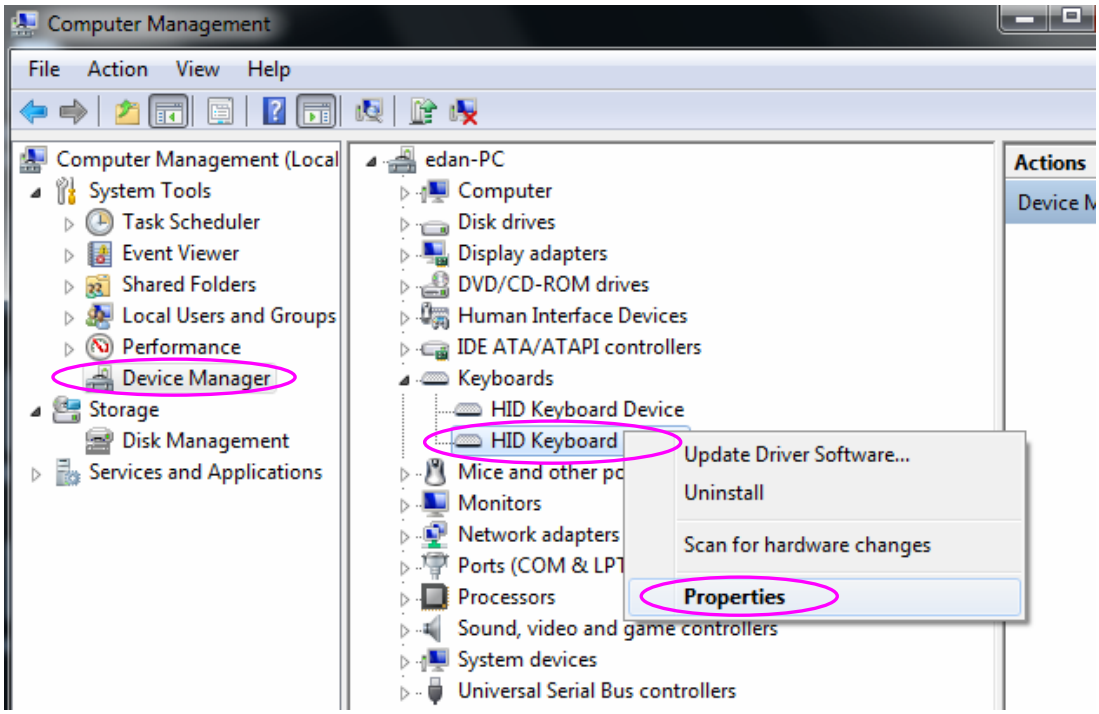
View the vendor ID and product ID on the PC:

a) Connect the bar code reader to the PC

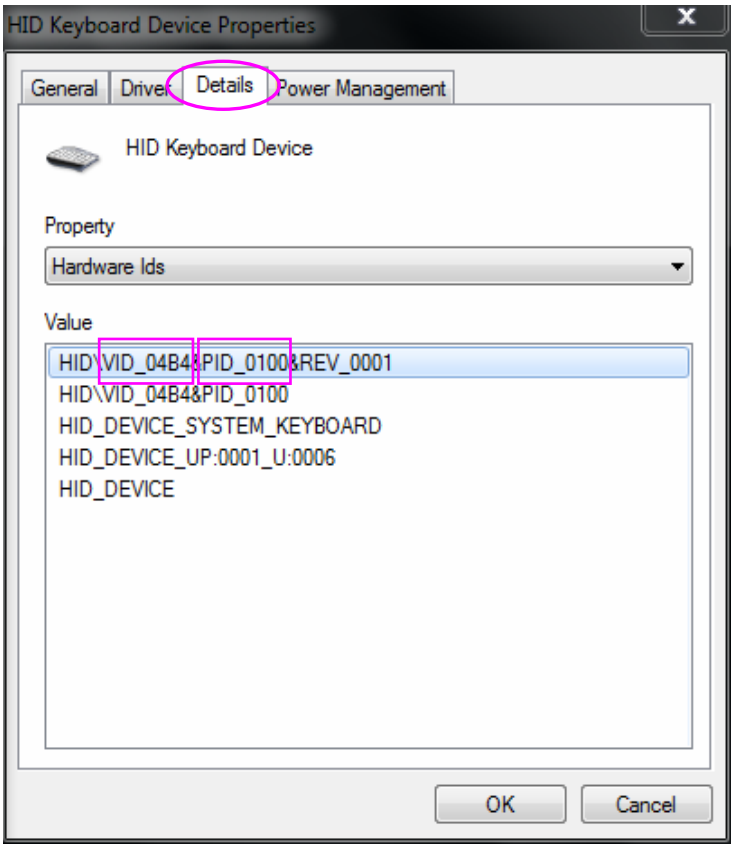
b) Click on **start**, right-click on **My Computer**, and then select **Manage** in the pop-up menu to open the **Computer Management window**.



c) In the Computer Management window, click on **Device Manager**. Right-click on **HID Keyboard Device**, and then select **Properties** in the pop-up menu.



d) Click on the **Details** tab in the HID Keyboard Device Properties window. View the vector ID (VID) and the product ID (PID). Take the following figure for example, the vector ID is 04B4, and the product ID is 0100.



4) Press **ESC** to return to the main screen.

2. Connect the bar code reader to USB socket 2 on the right panel of the electrocardiograph.

3. When the main screen is displayed, scan the patient's bar code with the bar code reader, and then the patient information will appear in the corresponding box.

NOTE: Only bar code readers recommended by the manufacturer can be used.

Chapter 7 Freezing ECG Waves

You can freeze the ECG waves displayed on the main screen.

Operation Method:

1) Press the function key **F2** below **Freeze** to display the freezing screen.

NOTE: Within ten seconds after returning to the main screen, pressing the function key **F2** can not display the freezing screen.

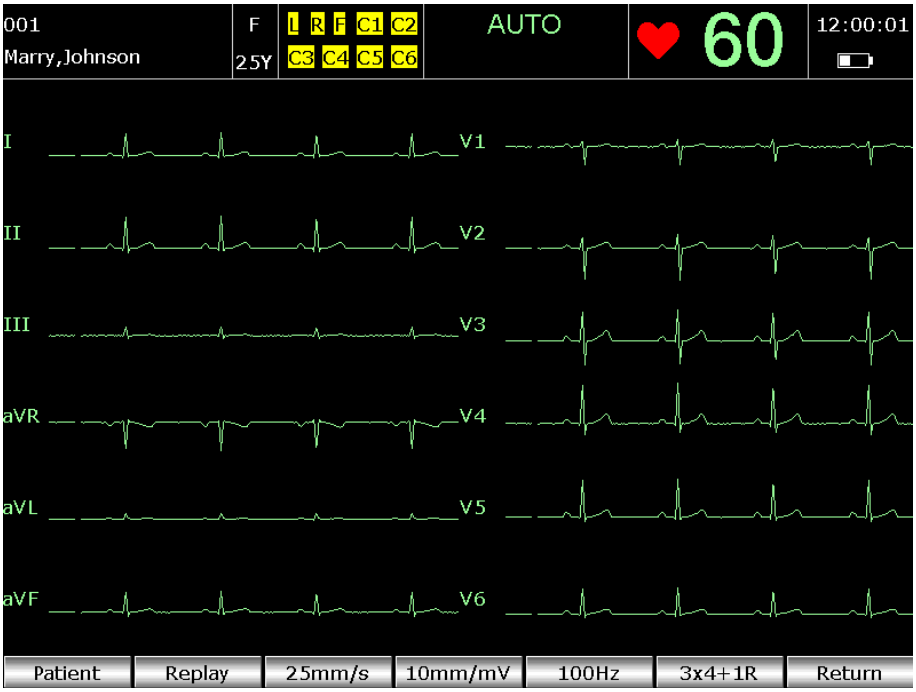


Figure 7-1 freezing screen

2) Press the function key **F3** to set the paper speed, press the function key **F4** to set the gain, press the function key **F5** to set the filter, and press the function key **F6** to set the printing style.

NOTE: When you press the function key **F7** below **Return** to exit the freezing screen, these settings will not be saved.

3) Press the function key **F2** below **Replay** to replay the frozen ECG waves on the Replay screen.

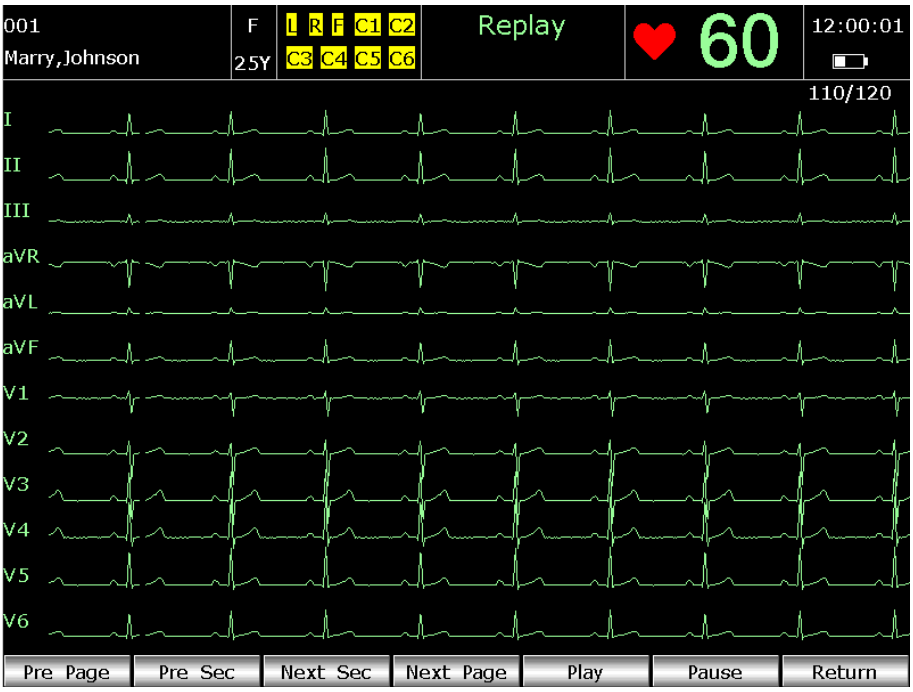


Figure 7-2 Replay screen

4) Press **F1** below **Pre Page** or **F4** below **Next Page** to turn pages.
5) Press **F2** below **Pre Sec** or **F3** below **Next Sec** to view the ECG waves of the previous or next second.
6) Press the function key **F5** below **Play** to display ECG waves continuously.
7) Press the function key **F6** below **Pause** to stop playing ECG waves.
8) Press the function key **F7** below **Return** to return to the main screen.

Chapter 8 Printing ECG Reports

There are four modes to print ECG reports.

In the auto mode, the lead groups are switched automatically according to the lead sequence during the printing course. After the ECG waves of one lead group are printed within a certain time, the system switches to print ECG waves of another lead group automatically. A 1mV calibration mark will be printed at the beginning of an ECG report.

In the manual mode, you can determine the lead group to be displayed and printed by pressing the Up or Down arrow.

In the rhythm mode, you can print 60s rhythm-lead ECG waveform of one lead in the **Single Lead** style or 20s rhythm-lead ECG waveform of three leads in the **Three Leads** style.

In the R-R analysis mode, you can select a lead to print its R-R histogram, R-R trend chart, 180s compressed ECG waveform and all the R-R interval values.

NOTE:

1. The working mode can not be changed during the printing course. Stop printing reports before changing the working mode.
2. Within three seconds after returning to the main screen, if you press the **START/STOP** key to print an ECG report in the auto quick mode or the manual mode, the recorder will not respond.
3. The electrocardiograph can not print ECG reports when transmitting data through USB socket 2.

8.1 Auto Mode

Operation Method:

1. To set **Mode Options**, **Auto DispStyle**, **Sampling Mode**, **Preview**, **Record Style**, **Rhythm Lead1/2/3**, or **Lead Sequence** (Optional)

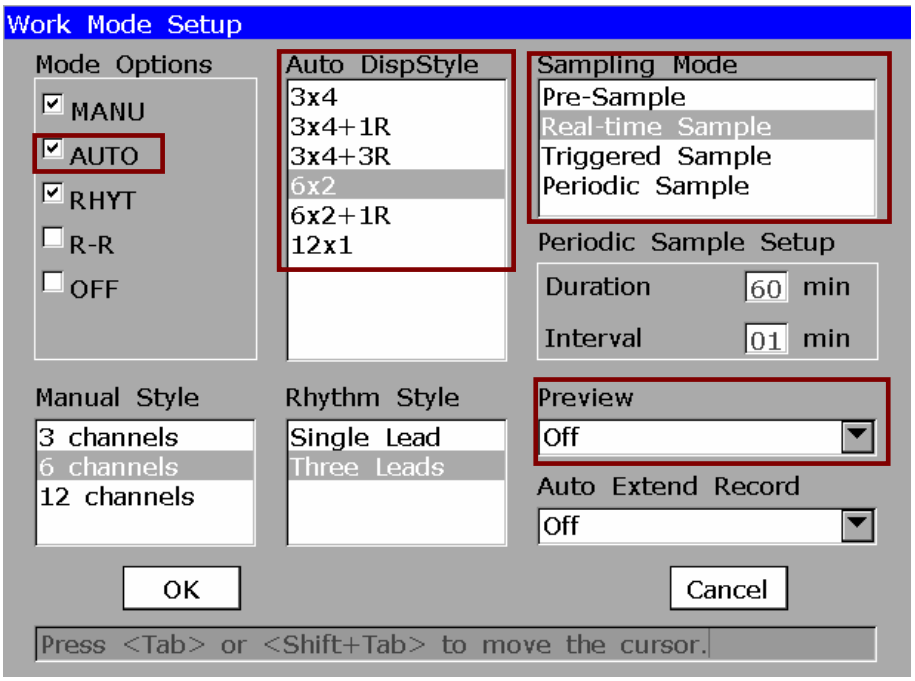
   When the main screen is displayed, press the function key **F6** below **Setup** to open the **System Setup screen**. The cursor is on **Work Mode**. Press to open the **Work Mode Setup window**.

   1) Press **Tab** or Shift + **Tab** to move the cursor to **AUTO**, press Spacebar to select it, and then a check mark √ appears in the box before **AUTO**.
   2) Press **Tab** or Shift + **Tab** to move the cursor to the **Auto DispStyle** list box, and then press the Up or Down arrow to highlight a style.

3) Press **Tab** or Shift + **Tab** to move the cursor to the **Sampling Mode** list box, and then press the Up or Down arrow to highlight a sampling mode. For details of the sampling mode, refer to Section 11.1.5, "Selecting Sampling Mode".

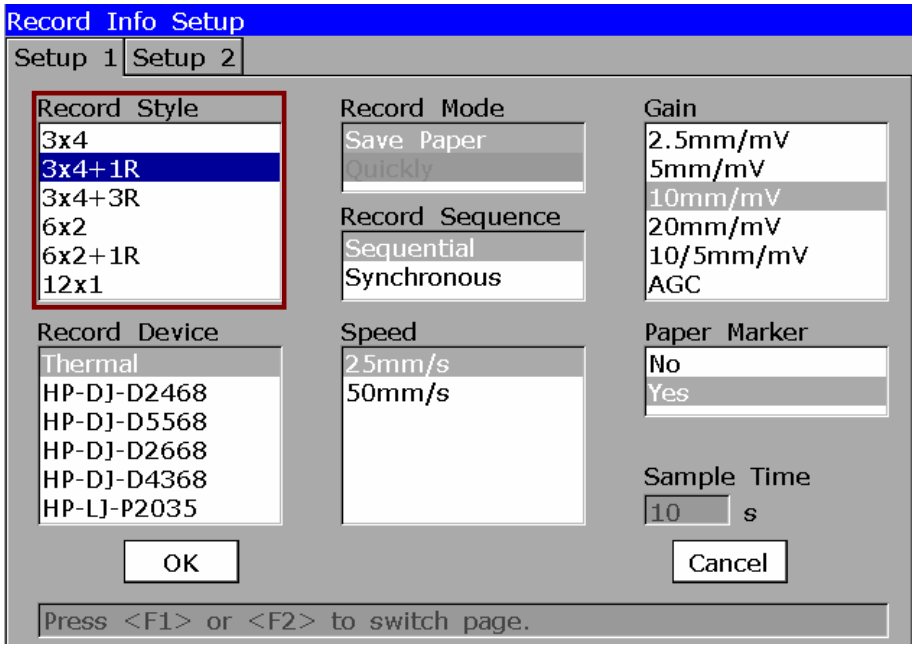
4) Press **Tab** or Shift + **Tab** to move the cursor to **Preview**, and then press the Up or Down arrow to highlight **Off** or **On**.

5) Press ↵, or press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press ↵.



6) On the **System Setup screen**, press **Tab** or Shift + **Tab**, or the Up, Down, Left or Right arrow to move the cursor. When the cursor is on **Record Info**, press ↵ to open the **Record Info Setup window**.

7) Press **Tab** or Shift + **Tab** to move the cursor to the **Record Style** list box, and then press the Up or Down arrow to select a style.



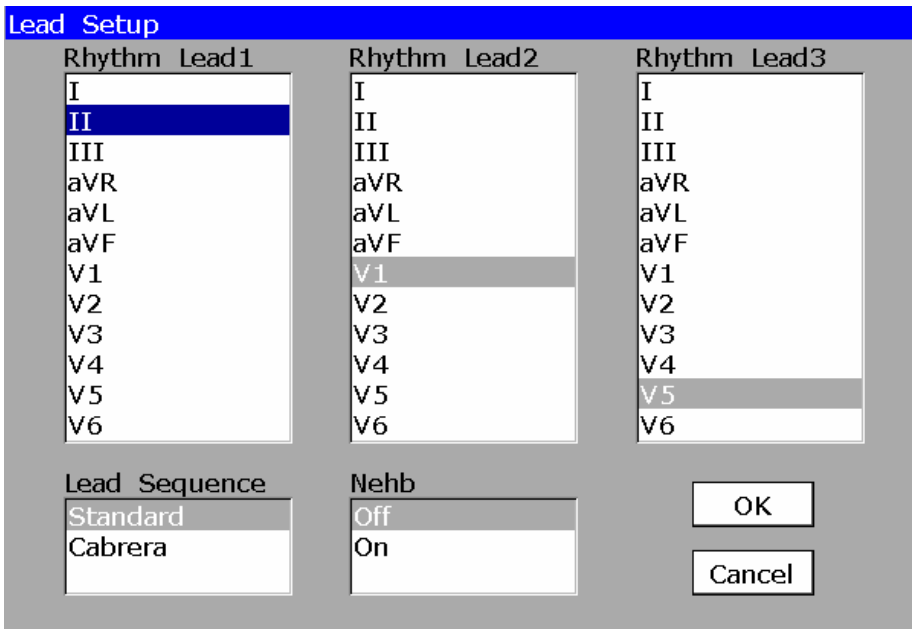
8) Press ↵, or press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press ↵.

9) On the **System Setup screen**, press **Tab** or Shift + **Tab**, or the Up, Down, Left or Right arrow to move the cursor. When the cursor is on **Lead**, press ↵ to open the **Lead Setup window**.

10) Press **Tab** or Shift + **Tab** to move the cursor to the **Rhythm Lead1/2/3** list box, and then press the Up or Down arrow to select a lead.

11) Press **Tab** or Shift + **Tab** to move the cursor to the **Lead Sequence** list box, and then press the Up or Down arrow to select a sequence.

12) Press ↵, or press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press ↵.



After setup, press **ESC** to return to the main screen.

2. When the main screen is displayed, press the **MODE** key to select the auto mode. Press **F3** to select a paper speed. Press **F4** to switch the gain. Press **F5** to set the EMG filter or the Lowpass filter.
3. Press the **START/STOP** key to print an ECG report. It will stop automatically after printing a complete ECG report of 12 leads. Or press the **START/STOP** key again to stop printing the report.
4. If **Preview** is set to **On** in the Work Mode Setup window, press the **START/STOP** key to display the preview screen.

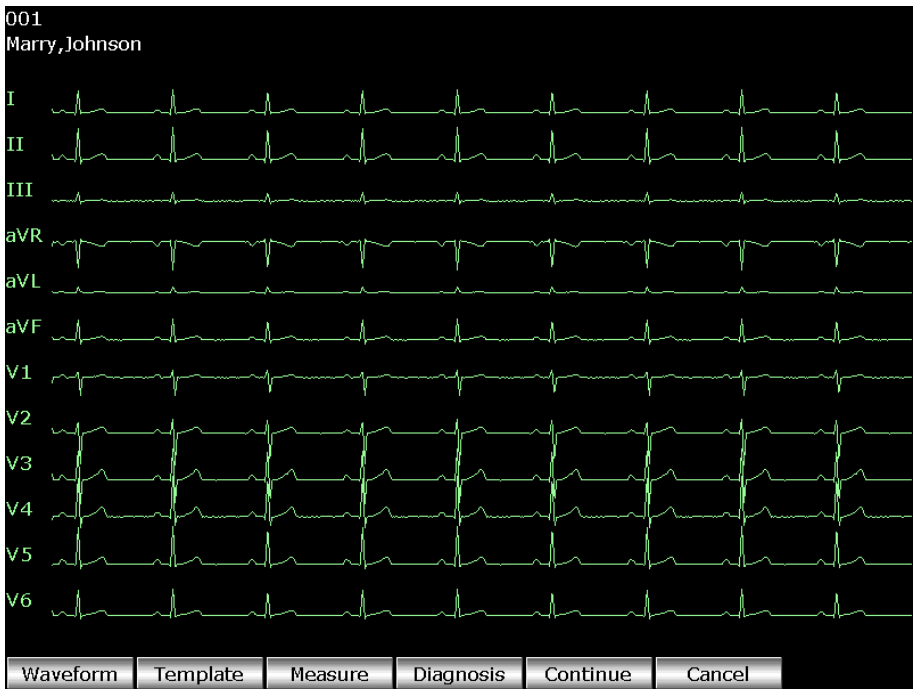


Figure 8-1 Waveform Preview Screen

1) Press the function key **F1** below **Waveform** to display the Waveform Preview Screen.
2) Press the function key **F2** below **Template** to display the template preview screen.
3) Press the function key **F3** below **Measure** to display the measure preview screen.
4) Press the function key **F4** below **Diagnosis** to open the diagnosis preview screen.
5) Press the function key **F5** below **Continue** to print an ECG report.
6) Press the function key **F6** below **Cancel** to stop printing the ECG report.

8.2 Manual Mode

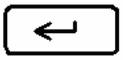
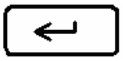
Operation Method:

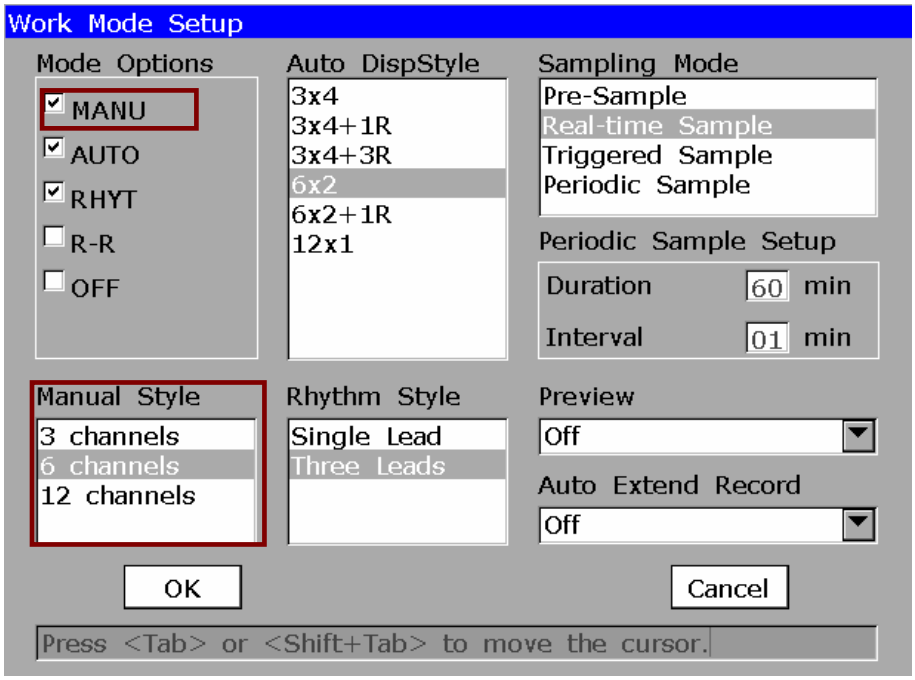
1. To set **Mode Options**, **Manual Style** or **Lead Sequence** (Optional)

   When the main screen is displayed, press the function key **F6** below **Setup** to open the **System Setup screen**. The cursor is on **Work Mode**. Press to open the **Work Mode Setup window**.

   1) Press **Tab** or Shift + **Tab** to move the cursor to **MANU**, press Spacebar to select it, and then a check mark √ appears in the box before **MANU**.

   2) Press **Tab** or Shift + **Tab** to move the cursor to the **Manual Style** list box, and then press the Up or Down arrow to highlight a style.

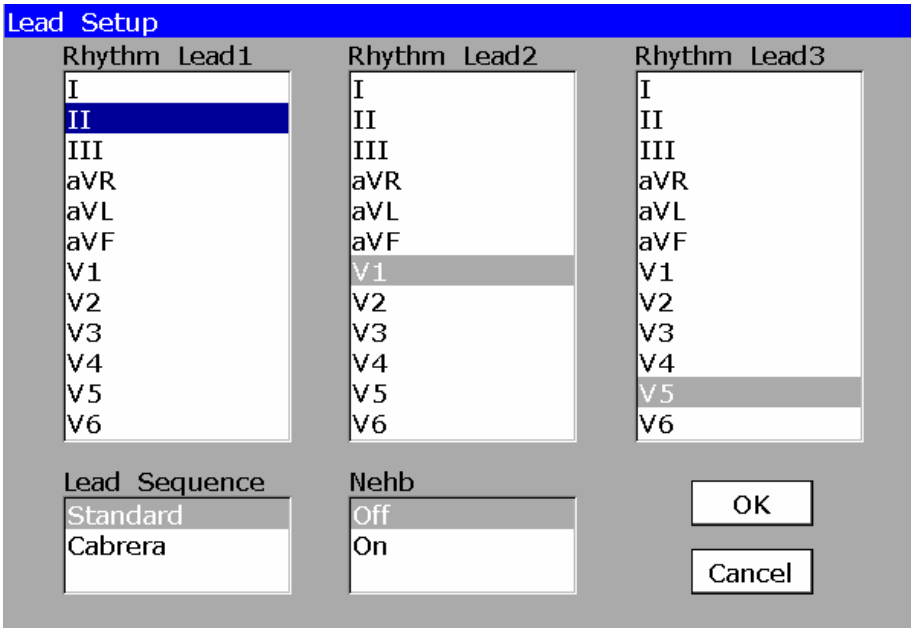
   3) Press  , or press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press  .



4) On the **System Setup screen**, press **Tab** or Shift + **Tab**, or the Up, Down, Left or Right arrow to move the cursor. When the cursor is on **Lead**, press ↵ to open the **Lead Setup window**.

5) Press **Tab** or Shift + **Tab** to move the cursor to the **Lead Sequence** list box, and then press the Up or Down arrow to select a sequence.

6) Press ↵, or press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press ↵.



After setup, press **ESC** to return to the main screen.

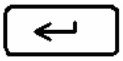
2. When the main screen is displayed, press the **MODE** key to select the manual mode. Press **F3** to select a paper speed. Press **F4** to switch the gain. Press **F5** to set the EMG filter or the Lowpass filter.
3. Press the Up or Down arrow to select the lead group to be displayed and printed.
4. Press the **START/STOP** key to print an ECG report.
5. Press the **START/STOP** key to stop printing the ECG report.

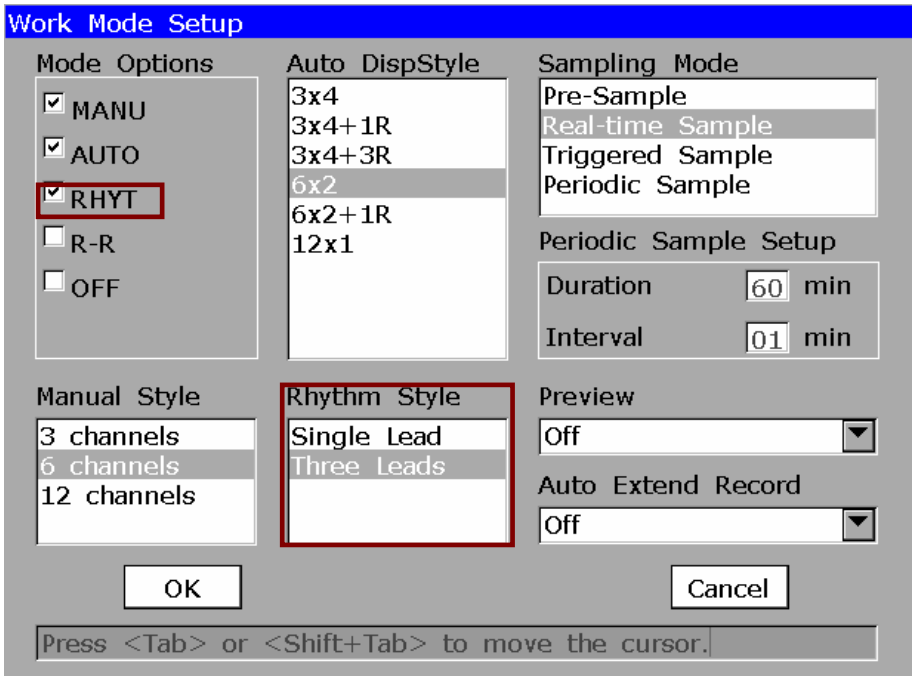
8.3 Rhythm Mode

Operation Method:

1. To set **Mode Options**, **Rhythm Style**, **Rhythm Lead1/2/3** or **Lead Sequence** (Optional)

   When the main screen is displayed, press the function key **F6** below **Setup** to open the **System Setup screen**. The cursor is on **Work Mode**. Press to open the **Work Mode Setup window**.

   1) Press **Tab** or Shift + **Tab** to move the cursor to **RHYT**, press Spacebar to select it, and then a check mark √ appears in the box before **RHYT**.
   2) Press **Tab** or Shift + **Tab** to move the cursor to the **Rhythm Style** list box, and then press the Up or Down arrow to highlight a style.
   3) Press , or press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press  .

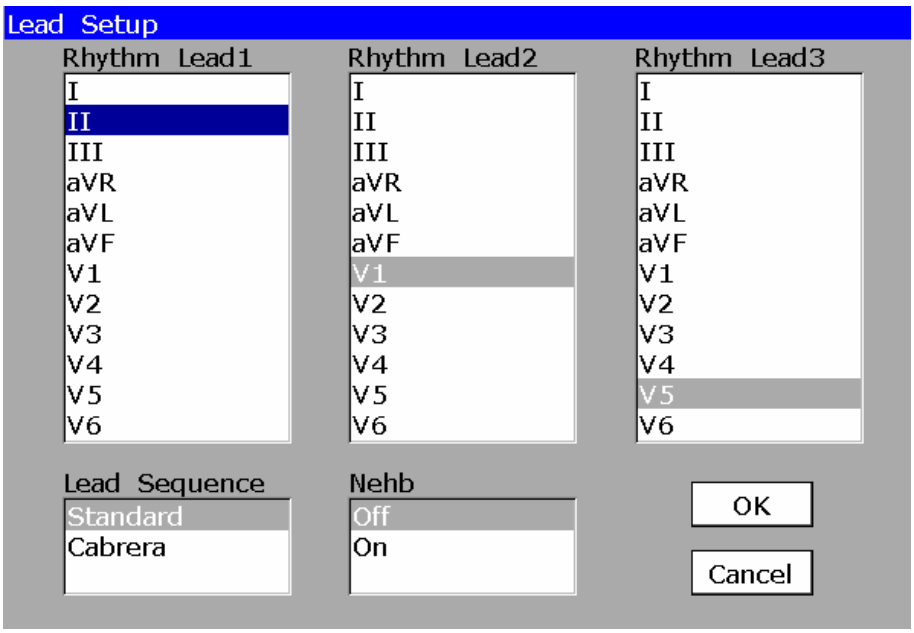


4) On the **System Setup screen**, press **Tab** or Shift + **Tab**, or the Up, Down, Left or Right arrow to move the cursor. When the cursor is on **Lead**, press ↵ to open the **Lead Setup window**.

5) Press **Tab** or Shift + **Tab** to move the cursor to the **Rhythm Lead1/2/3** list box, and then press the Up or Down arrow to select a lead.

6) Press **Tab** or Shift + **Tab** to move the cursor to the **Lead Sequence** list box, and then press the Up or Down arrow to select a sequence.

7) Press ↵, or press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press ↵.



After setup, press **ESC** to return to the main screen.

2. When the main screen is displayed, press the **MODE** key to select the rhythm mode. Press **F3** to select a paper speed. Press **F4** to switch the gain. Press **F5** to set the EMG filter or the Lowpass filter.
3. Press the **START/STOP** key to begin to count the sampling time. When the sampling time reaches 60s in the **Single Lead** style or 20s in the **Three Leads** style, it begins to print an ECG report.
4. It will stop automatically after printing a complete report of rhythm-lead ECG waveforms. Or press the **START/STOP** key again to stop printing the ECG report.

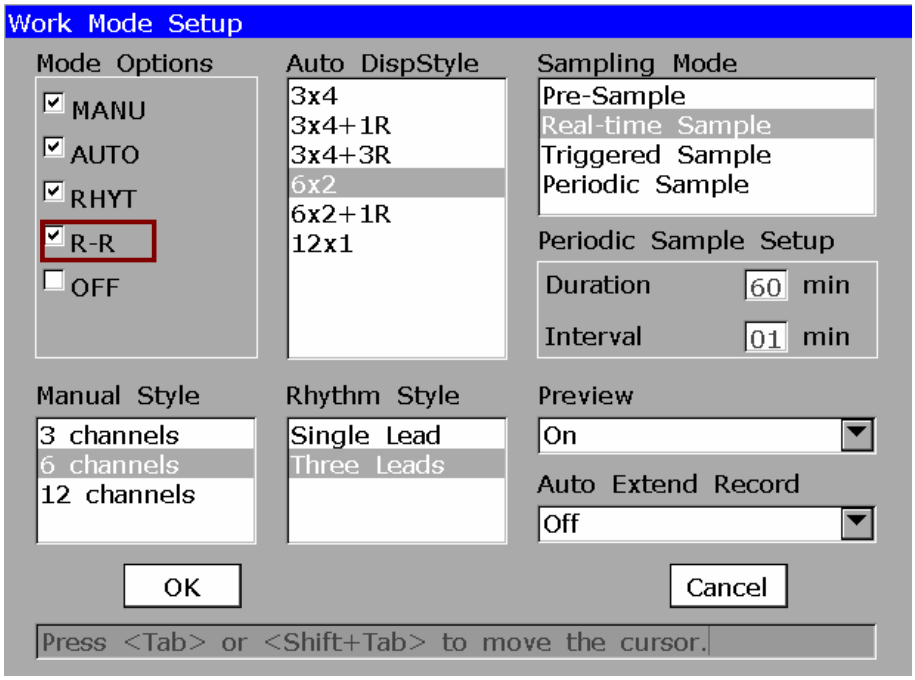
8.4 R-R Analysis Mode

Operation Method:

1. To set **Mode Options** or **Rhythm Lead1**

   When the main screen is displayed, press the function key **F6** below **Setup** to open the **System Setup screen**. The cursor is on **Work Mode**. Press ↵ to open the **Work Mode Setup window**.

   1) Press **Tab** or Shift + **Tab** to move the cursor to **R-R**, press Spacebar to select it, and then a check mark √ appears in the box before **R-R**.

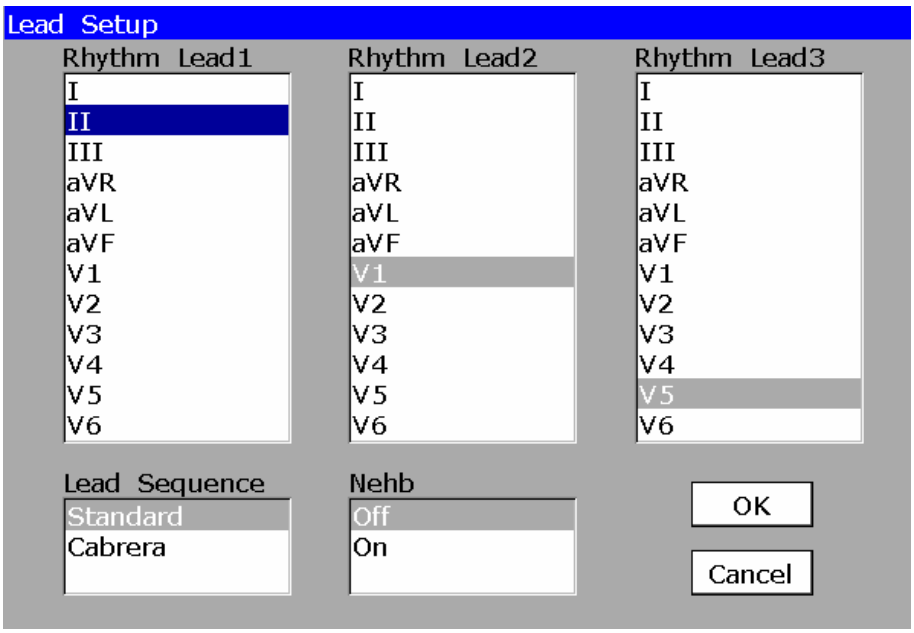


2) Press ↵, or press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press ↵.

3) On the **System Setup screen**, press **Tab** or Shift + **Tab**, or the Up, Down, Left or Right arrow to move the cursor. When the cursor is on **Lead**, press ↵ to open the **Lead Setup window**.

4) Press **Tab** or Shift + **Tab** to move the cursor to the **Rhythm Lead1** list box, and then press the Up or Down arrow to select a lead.

5) Press ↵, or press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press ↵.



After setup, press **ESC** to return to the main screen.

2. When the main screen is displayed, press the **MODE** key to select the R-R analysis mode. Press **F4** to switch the gain. Press **F5** to set the EMG filter or the Lowpass filter.
3. Press the **START/STOP** key to begin to count the sampling time. When the sampling time reaches 180s, it begins to print an ECG report.
4. It will stop automatically after a complete R-R analysis report is printed, or press the **START/STOP** key to stop printing the ECG report.

NOTE: In the R-R analysis mode, you can not set the speed. The constant speed is 25mm/s and the printing speed is 5mm/s, because in the R-R analysis mode, the ECG wave length is compressed to one fifth of the original wave length.

8.5 Copy Printing

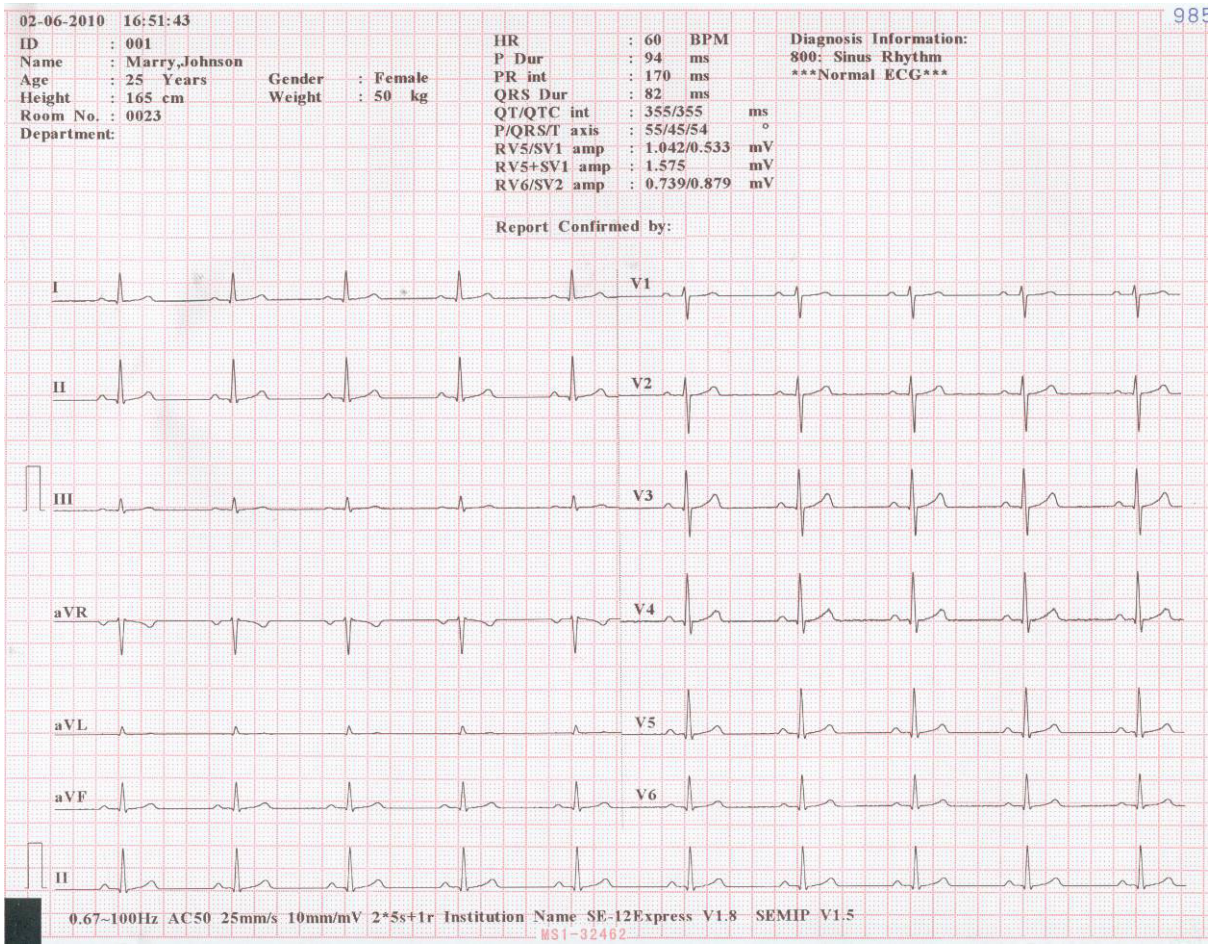
In the auto mode, pressing the **COPY** key can print the ECG report which was printed out last time. Pressing the **START/STOP** key can stop printing the ECG report.

8.6 ECG Reports

8.6.1 ECG Reports in the Auto Mode

8.6.1.1 Example of 6×2+1R

Save Paper Mode



The above figure shows an ECG report in the auto mode. The style is 6×2+1R. The ECG report includes:

Patient Information, Measure Information, Diagnosis Information, Report Confirmed by

Current Date and Current Time

6×2+1R ECG waves

0.67~100Hz (0.67Hz DFT Filter, 100Hz Lowpass Filter) AC50 (50Hz AC Filter)

25mm/s (Paper Speed) 10mm/mV (Gain)

2*5s+1r (12 leads are printed in 2 groups of 6, and every group is printed for about 5s, with one rhythm lead at the bottom simultaneously)

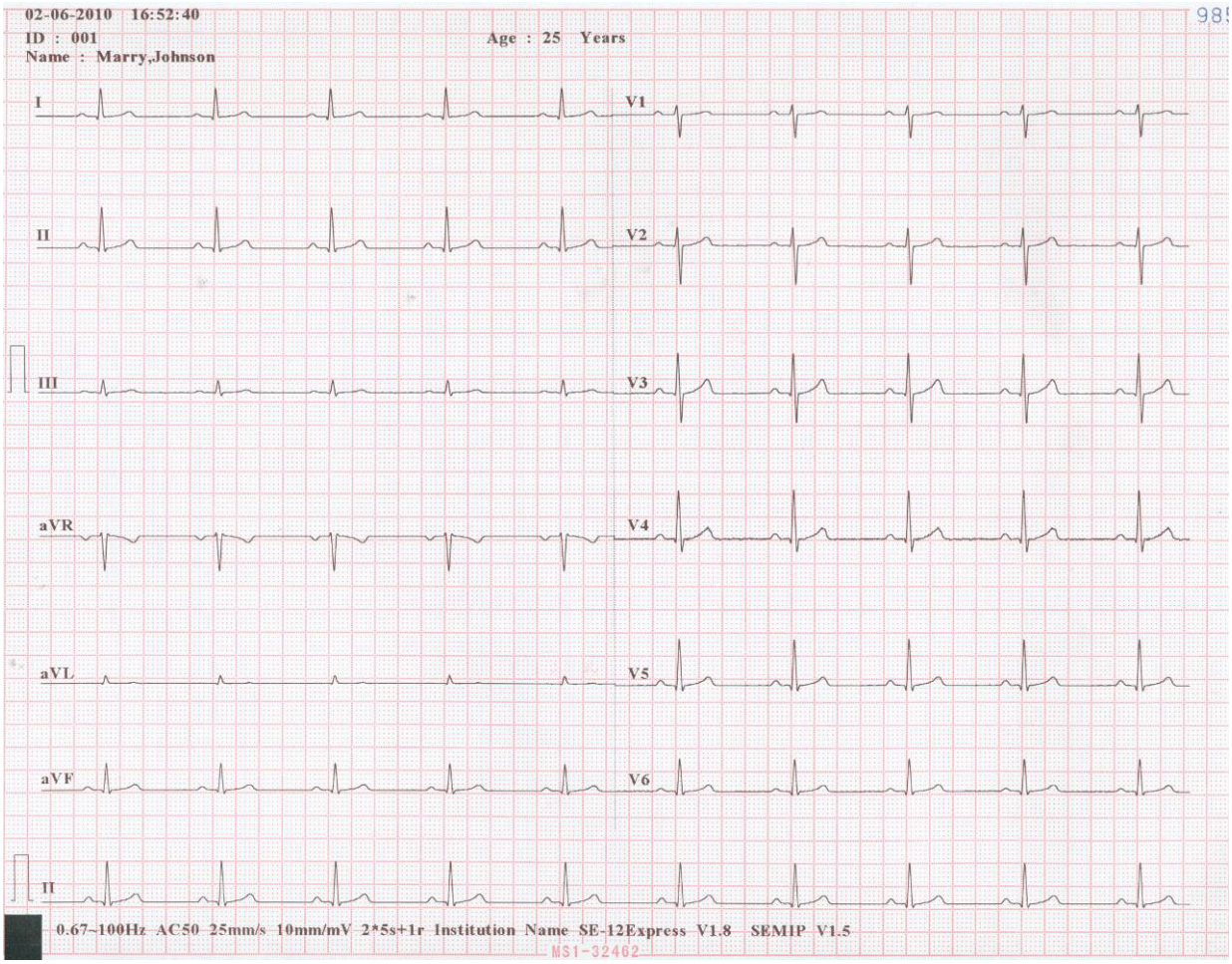
Institution Name

SE-12 Express (Electrocardiograph Model)

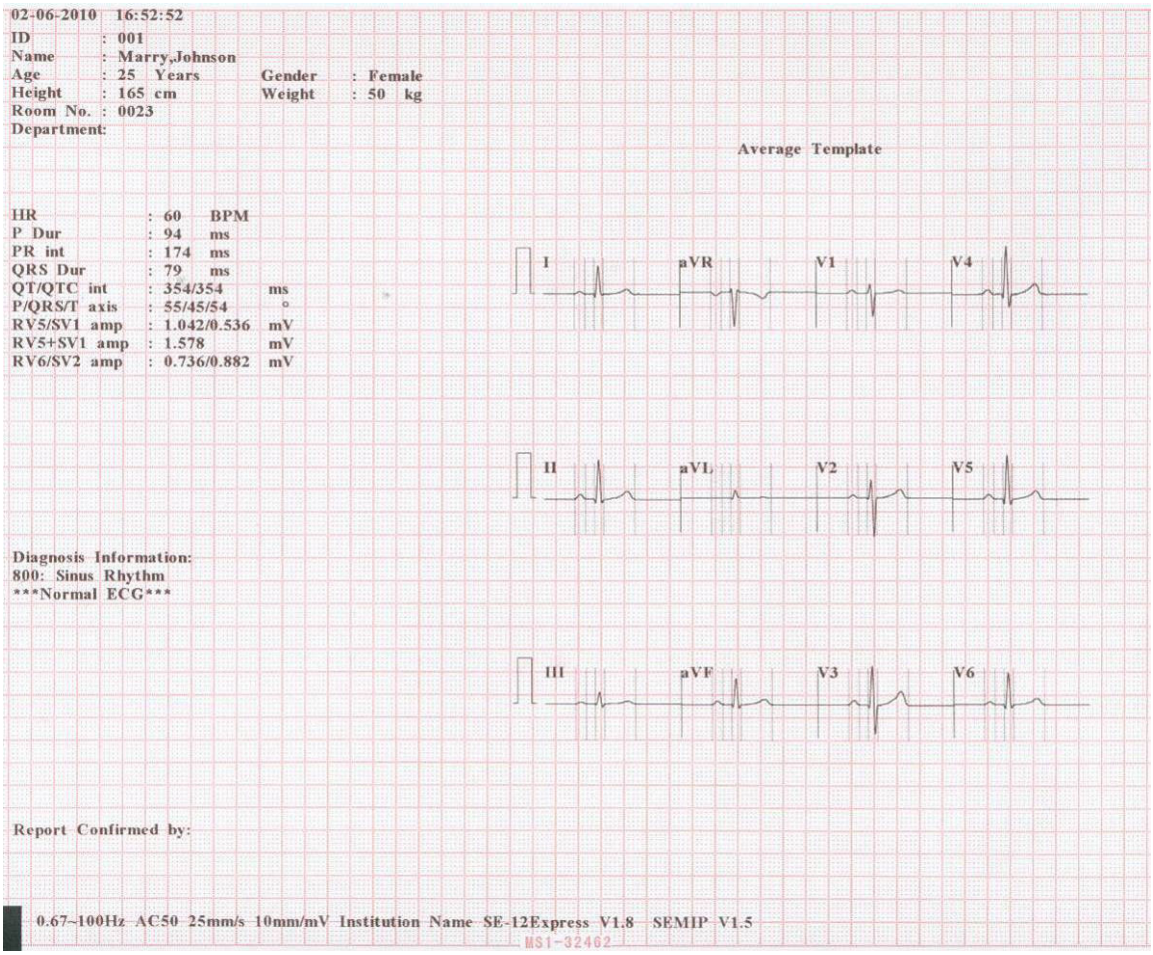
V1.8 (Software Version Number)

SEMIP V1.5(Algorithm Version Number)

Quick Mode



(a)



(b)

The above figure (a) and (b) show an ECG report in the auto mode. **Template** is selected, and **Record Style** is set to **6×2+1R**.

Figure (a) shows:

02-06-2010 16:52:40 (Current Date & Current Time)

ID: 001 (Patient ID)

Name: Marry, Johnson (Patient Name)

Age: 25 Years (Patient Age)

⎍ (1mV calibration mark)

I, II, III, aVR, aVL, aVF, V1, V2, V3, V4, V5, V6 (12 standard leads) and ECG waves

II on the bottom (Rhythm Lead) and rhythm wave

0.67~100Hz (0.67Hz DFT Filter, 100Hz Lowpass Filter)

AC50 (50Hz AC Filter)

25mm/s (Paper Speed)

10mm/mV (Gain)

2*5s+1r (12 leads are printed in 2 groups of 6, and every group is printed for about 5s, with one rhythm lead at the bottom simultaneously)

Institution Name

SE-12 Express (Electrocardiograph Model)

V1.8 (Software Version Number)

SEMIP V1.5(Algorithm Version Number)

Figure (b) shows:

Patient Information, Measure Information, Diagnosis Information, Average Template, Report Confirmed by, Current Date and Current Time, 0.67Hz (DFT Filter), 100Hz (Lowpass Filter), AC50 (50Hz AC Filter), 25mm/s (Paper Speed), 10mm/mV (Gain), Institution Name, SE-12 Express (Electrocardiograph Model), V1.8 (Software Version Number), SEMIP V1.5(Algorithm Version Number).

Patient Information includes:

ID, Name, Age, Gender, Height, Weight, Room No., Department

Measure Information includes:

HR (Heart Rate)

P Dur----P wave duration: the average P-wave duration from several selected dominant beats;

PR int----P-R interval: the average P-R interval from several selected dominant beats;

QRS Dur----QRS complex duration: the average QRS complex duration from several selected dominant beats;

QT/QTC int----Q-T interval: the average Q-T interval from several selected dominant beats / Normalized QT interval;

P/QRS/T axis----Dominant direction of the average integrated ECG vectors;

RV5/SV1 amp----The maximum of the amplitude of R or R' wave of one selected dominant beat from lead V5 / The maximum absolute value of the amplitude of S or S' wave of one selected dominant beat from lead V1;

RV5+SV1 amp---- Sum of RV5 and SV1;

RV6/SV2 amp---- The maximum of the amplitude of R or R' wave of one selected dominant beat from lead V6 / The maximum absolute value of the amplitude of S or S' wave of one selected dominant beat from lead V2;

Diagnosis Information:

Diagnosis information shows the auto diagnosis result.

Average Template:

Average template shows the average value of 10s sampled ECG signals of every lead.

The broken lines on the template are position markers. They respectively mark the start and end points of the P and QRS waves, and the end point of the T wave.

8.6.1.2 Example of 3×4+1R

The above figure shows an ECG report in the auto mode. The style is 3×4+1R. The ECG report includes:

Patient Information, Measure Information, Diagnosis Information, Report Confirmed by

02-06-2010 16:53:52 (Current Date and Current Time)

3×4+1R ECG waves

0.67~100Hz (0.67Hz DFT Filter, 100Hz Lowpass Filter) AC50 (50Hz AC Filter)

25mm/s (Paper Speed) 10mm/mV (Gain)

4*2.5s+1r (12 leads are printed in 4 groups of 3, and every group is printed for about 2.5s, with one rhythm lead at the bottom simultaneously)

Institution Name

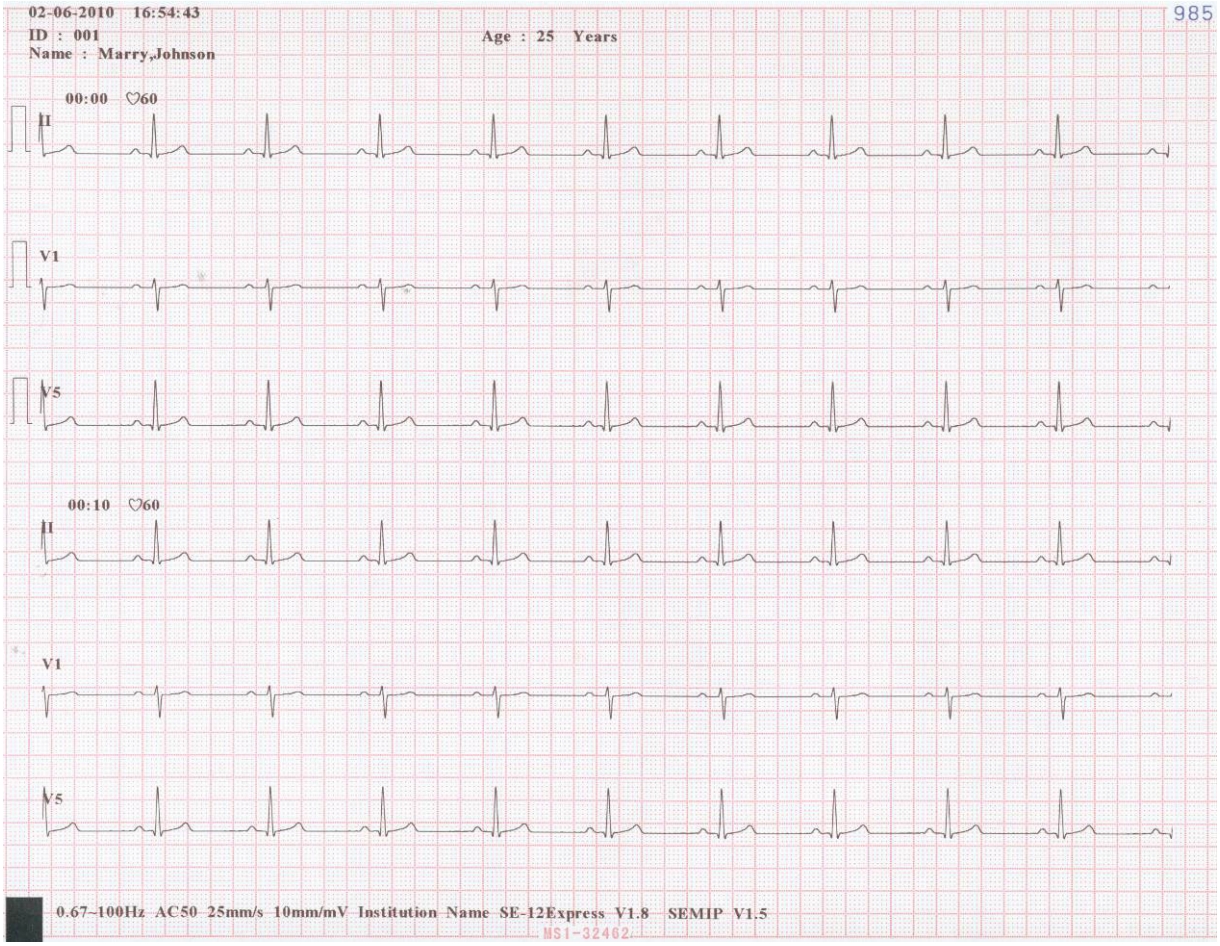
SE-12 Express (Electrocardiograph Model)

V1.8 (Software Version Number)

SEMIP V1.5(Algorithm Version Number)

NOTE: Please refer to Section 8.6.1.1 for the explanation of the patient information, measure information and diagnosis information.

8.6.2 ECG Reports in the Rhythm Mode



The above figure shows an ECG report in the rhythm mode, and **Rhythm Style** is set to **Three Leads**.

02-06-2010 16:54:43 (Current Date & Current Time)

ID: 001 (Patient ID)

Age: 25 Years (Patient Age)

Name: Marry, Johnson (Patient Name)

00:00, 00:10 (Timer)

60 (Heart Rate)

(1mV calibration mark) II, V1, V5 (Rhythm Lead Name)

20s rhythm waveform of lead II / V1 / V5

0.67~100Hz (0.67Hz DFT Filter, 100Hz Lowpass Filter)

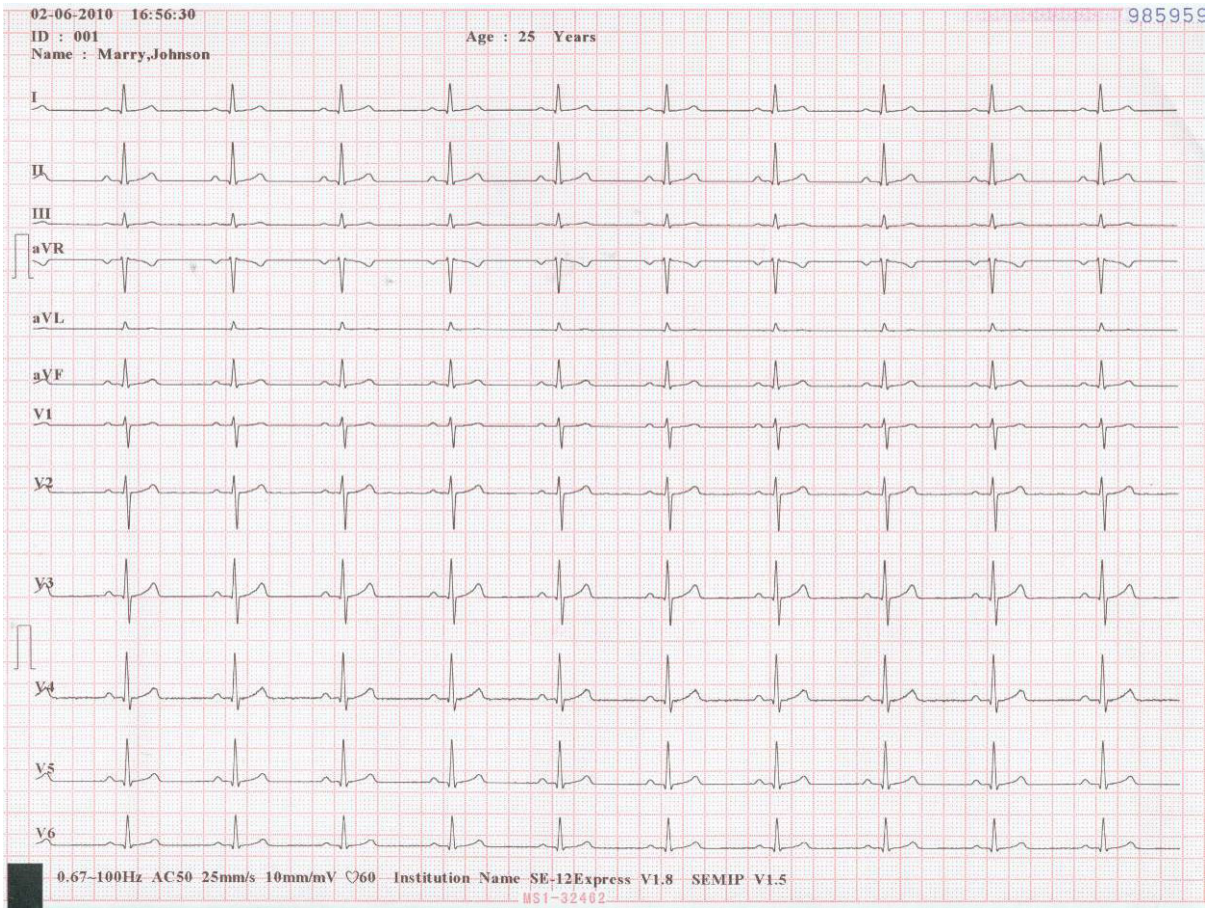
AC50 (50Hz AC Filter) 25mm/s (Paper Speed)

10mm/mV (Gain) Institution Name

SE-12 Express (Electrocardiograph Model) V1.8 (Software Version Number)

SEMIP V1.5(Algorithm Version Number)

8.6.3 ECG Reports in the Manual Mode



The above figure shows an ECG report in the manual mode, and **Manual Style** is set to **12 channels**.

02-06-2010 16:56:30 (Current Date & Current Time)

ID: 001 (Patient ID)

Age: 25 Years (Patient Age)

Name: Marry, Johnson (Patient Name)

⎍ (1mV calibration mark)

I, II, III, aVR, aVL, aVF, V1, V2, V3, V4, V5, V6 (12 standard leads)

ECG waveform of 12 standard leads

0.67~100Hz (0.67Hz DFT Filter, 100Hz Lowpass Filter)

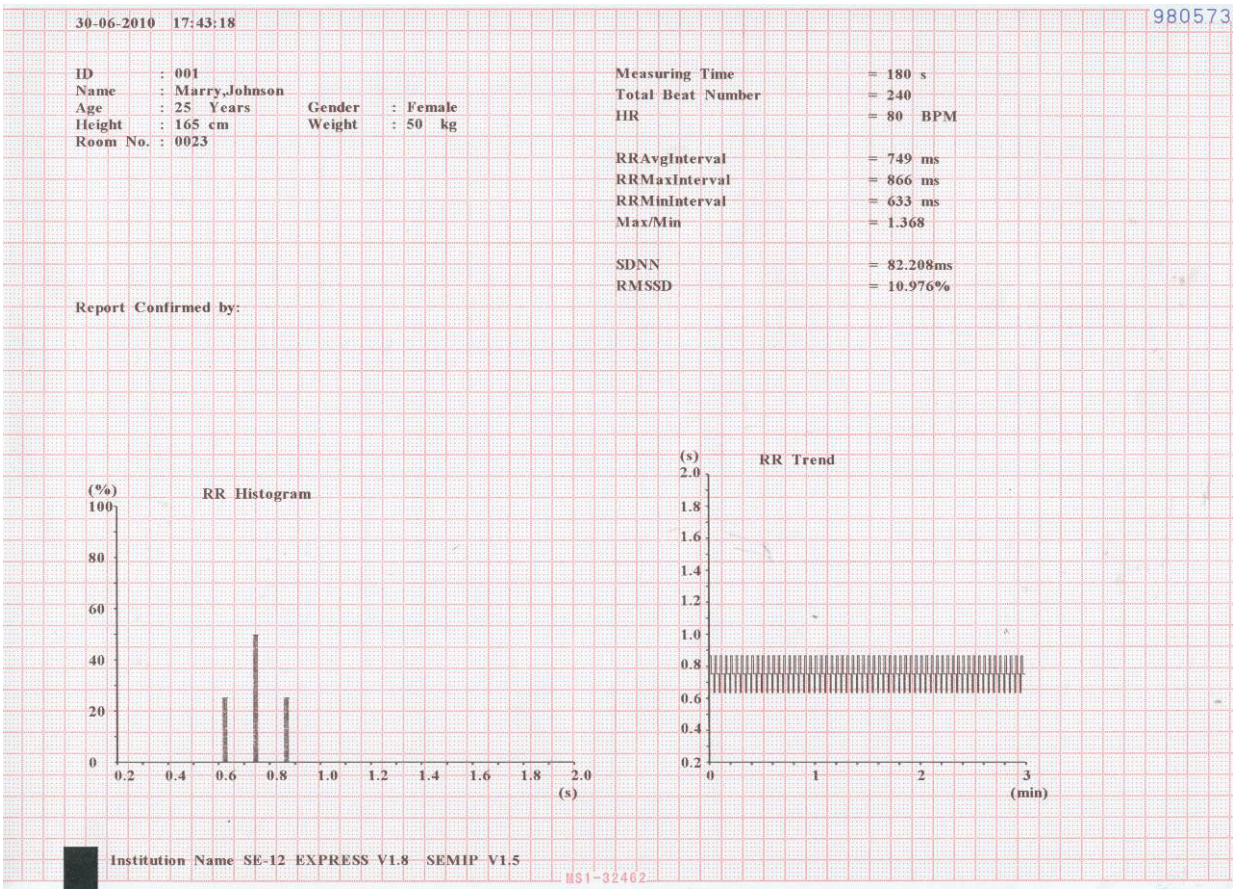
AC50 (50Hz AC Filter) 25mm/s (Paper Speed)

10mm/mV (Gain) ♡60 (Heart Rate)

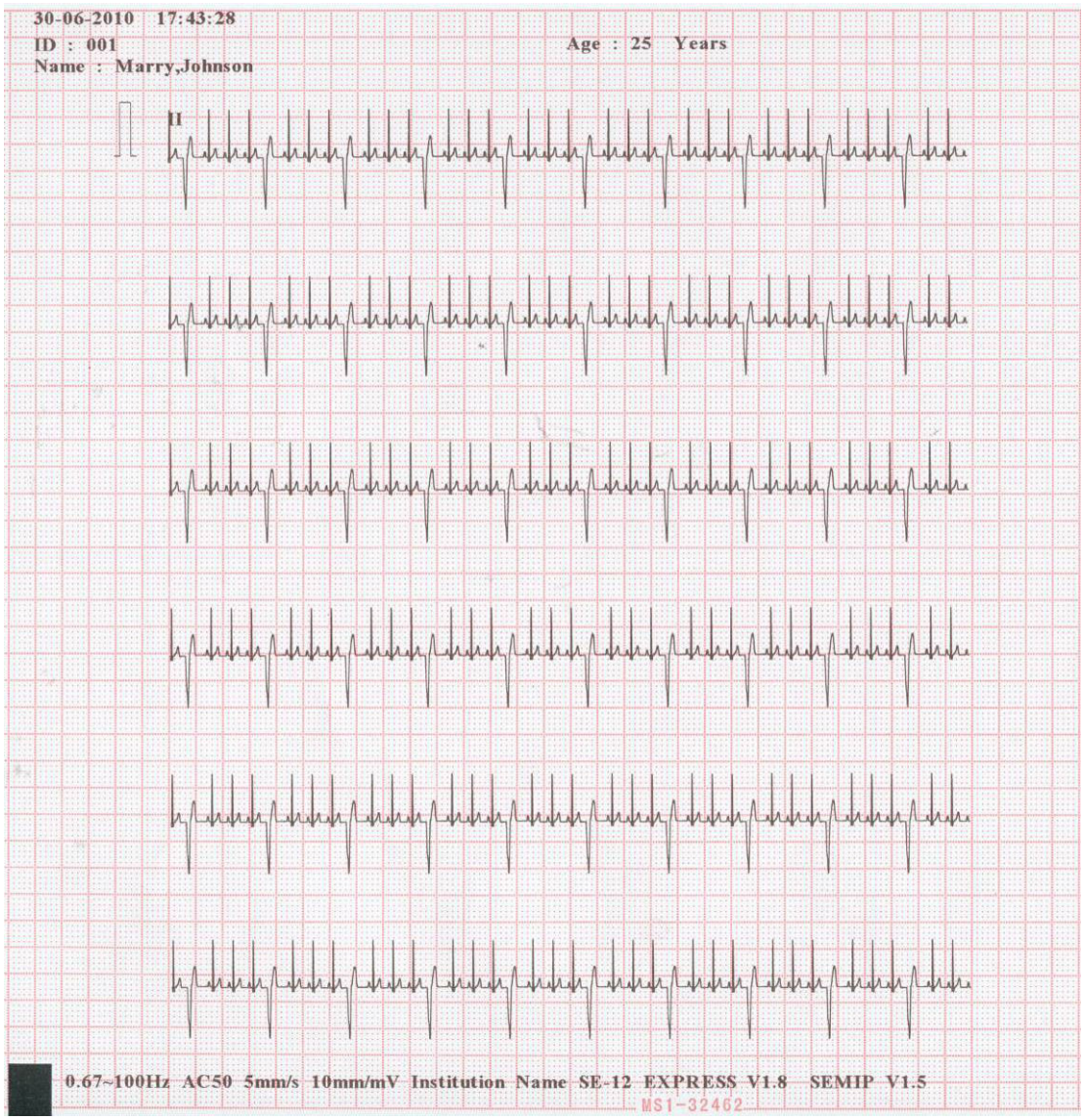
Institution Name SE-12 Express (Electrocardiograph Model)

V1.8 (Software Version Number) SEMIP V1.5(Algorithm Version Number)

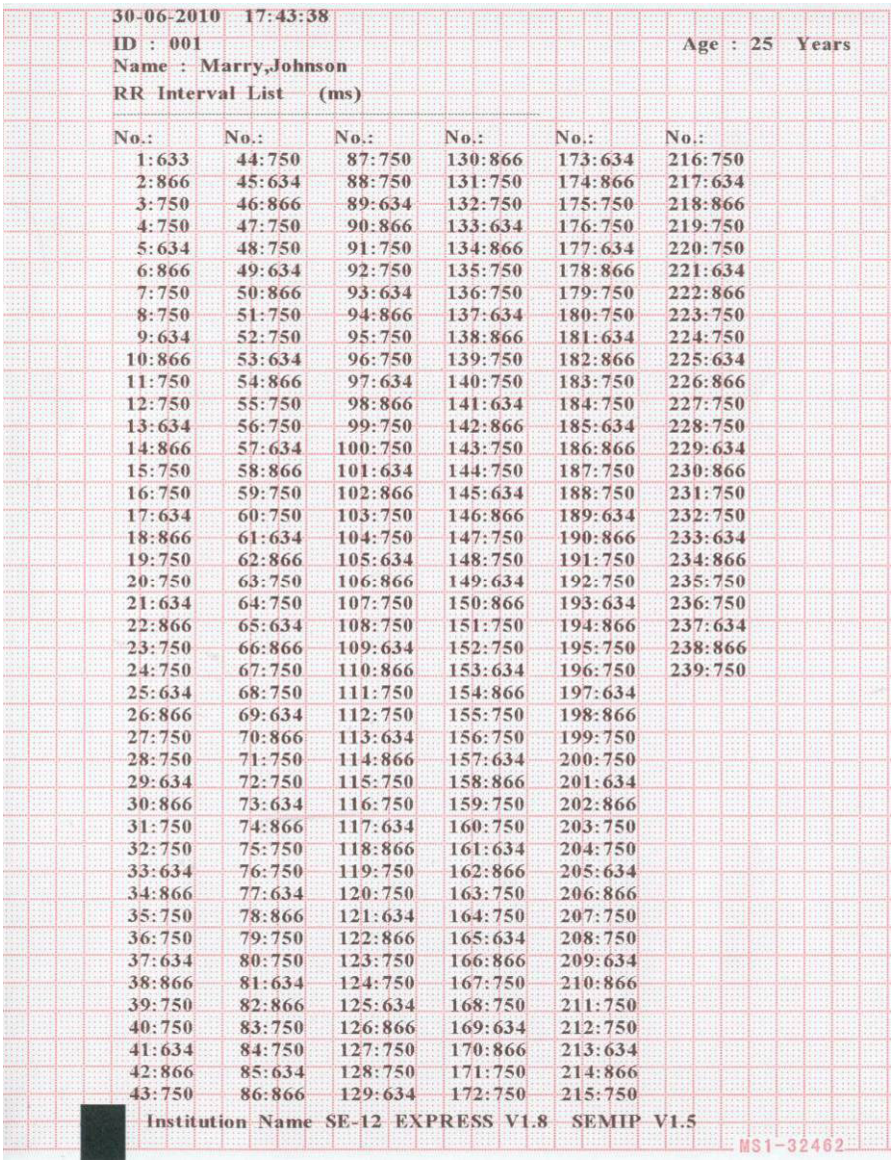
8.6.4 ECG Reports in the R-R Analysis Mode



(a)


30-06-2010 17:43:28
ID : 001
Name : Marry,Johnson
Age : 25 Years
II
0.67~100Hz AC50 5mm/s 10mm/mV Institution Name SE-12 EXPRESS V1.8 SEMIP V1.5
MS1-32462

(b)



30-06-2010 17:43:38
ID : 001 Age : 25 Years
Name : Marry,Johnson
RR Interval List (ms)

No.:	No.:	No.:	No.:	No.:	No.:
1:633	44:750	87:750	130:866	173:634	216:750
2:866	45:634	88:750	131:750	174:866	217:634
3:750	46:866	89:634	132:750	175:750	218:866
4:750	47:750	90:866	133:634	176:750	219:750
5:634	48:750	91:750	134:866	177:634	220:750
6:866	49:634	92:750	135:750	178:866	221:634
7:750	50:866	93:634	136:750	179:750	222:866
8:750	51:750	94:866	137:634	180:750	223:750
9:634	52:750	95:750	138:866	181:634	224:750
10:866	53:634	96:750	139:750	182:866	225:634
11:750	54:866	97:634	140:750	183:750	226:866
12:750	55:750	98:866	141:634	184:750	227:750
13:634	56:750	99:750	142:866	185:634	228:750
14:866	57:634	100:750	143:750	186:866	229:634
15:750	58:866	101:634	144:750	187:750	230:866
16:750	59:750	102:866	145:634	188:750	231:750
17:634	60:750	103:750	146:866	189:634	232:750
18:866	61:634	104:750	147:750	190:866	233:634
19:750	62:866	105:634	148:750	191:750	234:866
20:750	63:750	106:866	149:634	192:750	235:750
21:634	64:750	107:750	150:866	193:634	236:750
22:866	65:634	108:750	151:750	194:866	237:634
23:750	66:866	109:634	152:750	195:750	238:866
24:750	67:750	110:866	153:634	196:750	239:750
25:634	68:750	111:750	154:866	197:634	
26:866	69:634	112:750	155:750	198:866	
27:750	70:866	113:634	156:750	199:750	
28:750	71:750	114:866	157:634	200:750	
29:634	72:750	115:750	158:866	201:634	
30:866	73:634	116:750	159:750	202:866	
31:750	74:866	117:634	160:750	203:750	
32:750	75:750	118:866	161:634	204:750	
33:634	76:750	119:750	162:866	205:634	
34:866	77:634	120:750	163:750	206:866	
35:750	78:866	121:634	164:750	207:750	
36:750	79:750	122:866	165:634	208:750	
37:634	80:750	123:750	166:866	209:634	
38:866	81:634	124:750	167:750	210:866	
39:750	82:866	125:634	168:750	211:750	
40:750	83:750	126:866	169:634	212:750	
41:634	84:750	127:750	170:866	213:634	
42:866	85:634	128:750	171:750	214:866	
43:750	86:866	129:634	172:750	215:750	

Institution Name SE-12 EXPRESS V1.8 SEMIP V1.5
MS1-32462

(c)

The above figure (a), (b) and (c) show an ECG report in the R-R analysis mode.

Figure (a) shows:

Current Date & Current Time

Patient Information (Name, ID, Gender, Age, Height, Weight)

Measuring Time

Total Beat Number

HR (Heart Rate)

RR Avg Interval (Average RR interval)

RR Max Interval (Maximum RR interval)

RR Min Interval (Minimum RR interval)

Max/Min (Ratio of Maximum RR interval to Minimum RR interval)

SDNN (Standard Deviation of Normal to Normal Intervals)

RMSSD (Root Mean Square Successive Difference)

RR Histogram

RR Trend

Figure (b) shows:

Current Date & Current Time

Patient Information (Name, ID, Age)

Gain, Speed, Filter

(1mV calibration mark)

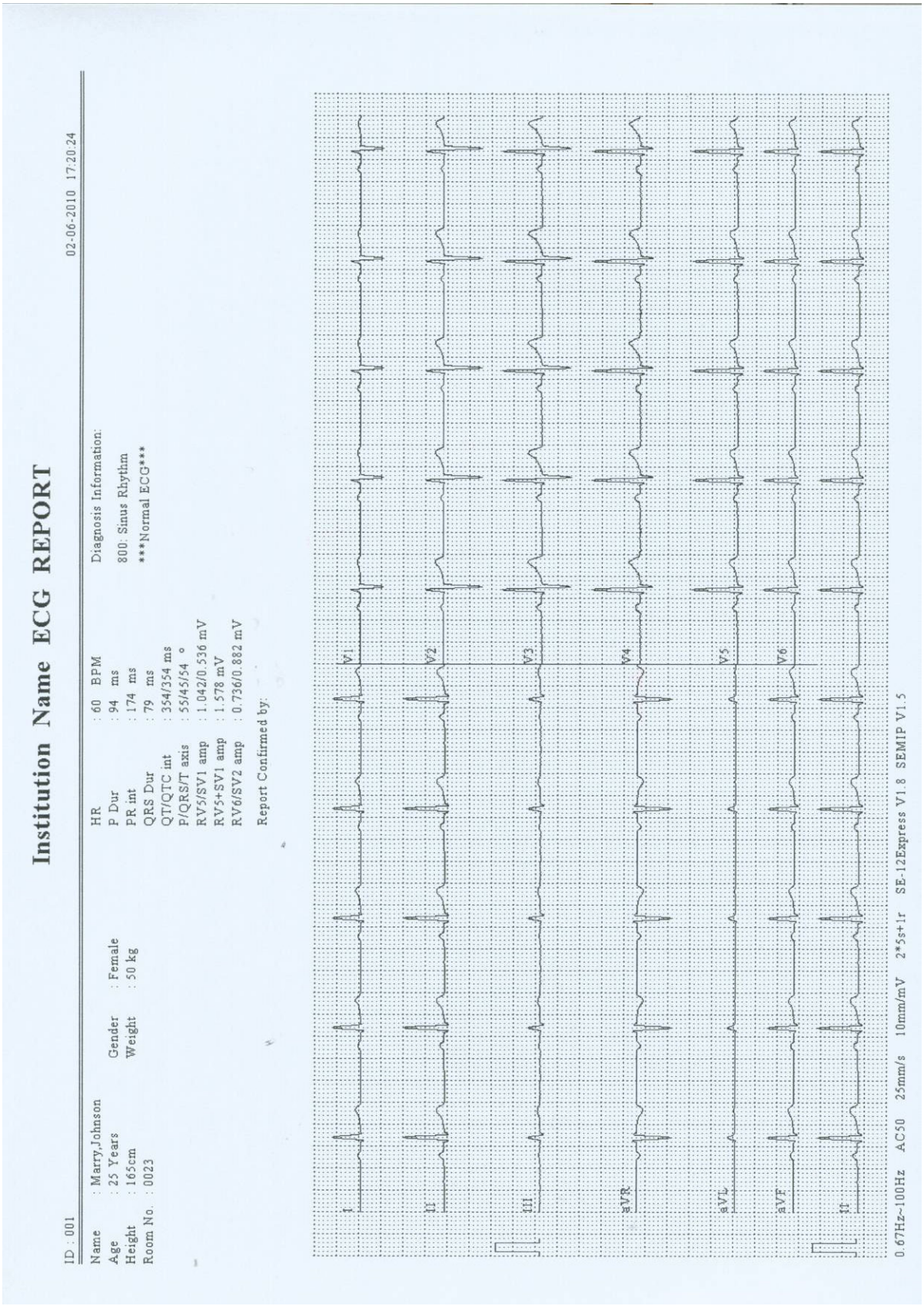
II (Lead name)

180s compressed ECG wave of Lead II

Figure (c) shows:

All the RR interval values within the measuring time

8.6.5 ECG Reports Printed by the USB Printer



As the above figure shows, the ECG report printed by the USB printer includes:

Institution Name Date and Time

Patient Information

Measurement Information

Diagnosis Information;

Report Confirmed by;

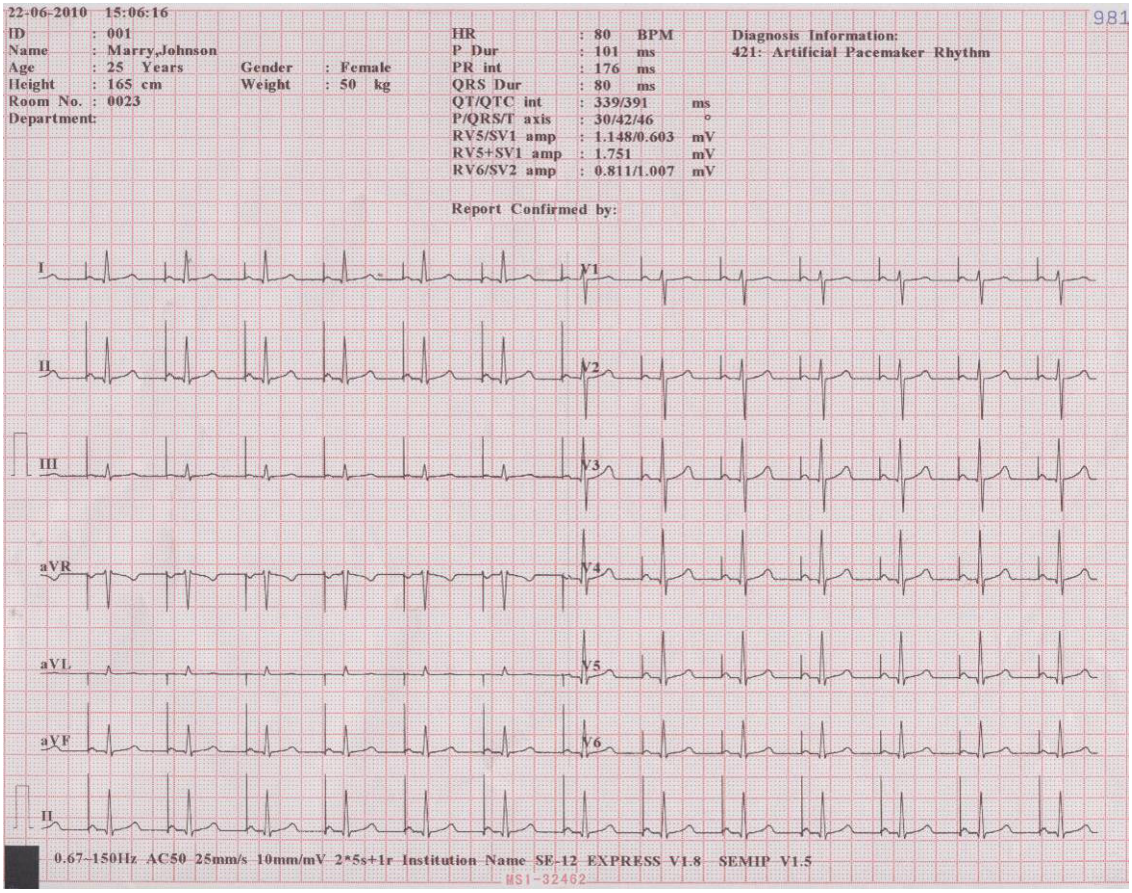
ECG waves of 12 leads

DFT Filter, Lowpass Filter, AC Filter, Paper Speed, Gain;

SE-12 Express (Electrocardiograph Model) V1.8 (Software Version Number)

SEMIP V1.5(Algorithm Version Number)

8.6.6 ECG Report of Patient with Pacemaker

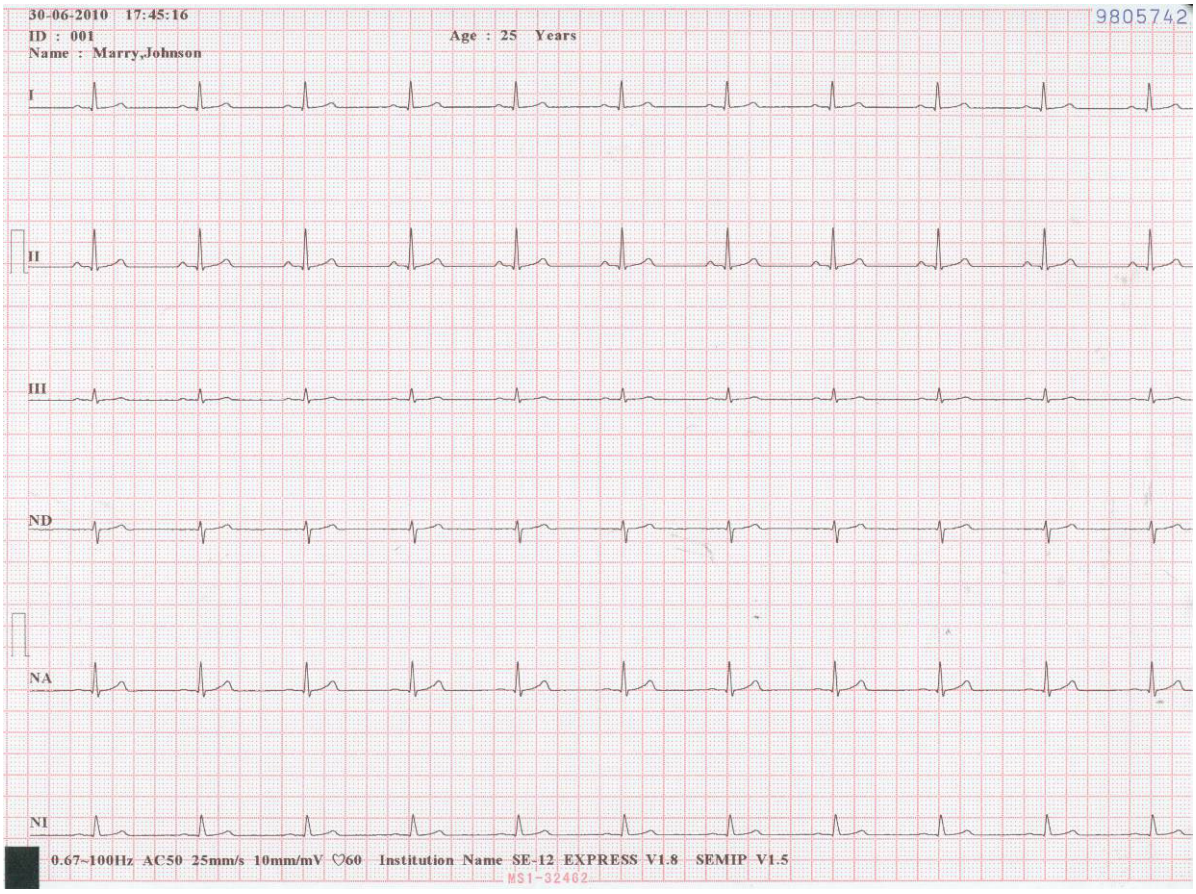


The above figure shows the ECG report of a patient with a pacemaker. **Pacemaker Detection Sens.** is set to **High**, and the Lowpass filter is set to **150Hz**.

NOTE:

1. To the patient with a pacemaker, the EMG filter should be set to **Off** and the Lowpass filter should be set to **150Hz**; or else, the amplitude of the pulses may decrease, the width may increase, and the diagnosis results may not include the pacemaker information.
2. To the patient with a pacemaker, the results given by the equipment may be invalid.

8.6.7 ECG Report of Nehb Lead



ECG report of Nehb lead includes:

30-06-2010 17:45:16 (Current Date & Current Time)

ID: 001 (Patient ID)

Age: 25 Years (Patient Age)

Name: Marry, Johnson (Patient Name)

⎍ (1mV calibration mark)

I, II, III, ND, NA, NI (Nehb leads)

0.67~100Hz (0.67Hz DFT Filter, 100Hz Lowpass Filter)

AC50 (50Hz AC Filter) 25mm/s (Paper Speed)

10mm/mV (Gain) ♡60 (Heart Rate)

Institution Name SE-12 Express (Electrocardiograph Model)

V1.8 (Software Version Number) SEMIP V1.5(Algorithm Version Number)

Chapter 9 Transmitting ECG Data Automatically

9.1 Transmitting ECG Data to the PC

NOTE:

1. To transmit ECG data in DAT format to the PC, the Smart ECG Viewer software of the manufacturer must be installed in the PC. You should log into the Smart ECG Viewer software before transmission.
2. To transmit ECG data in SCP/FDA-XML/PDF format to the PC, the FTP receiving software must be installed in the PC. You should log into the FTP receiving software before transmission.
3. By default, the ECG file format is DAT. You can activate SCP/FDA-XML/PDF function on the **Advanced Setup screen** For details, refer to Section 9.1.3, “Transmitting ECG Data in SCP/FDA-XML/PDF Format Through Net Cable”.

9.1.1 Transmitting ECG Data in DAT Format through Serial Cable

1. Connect the RS232 socket of the PC to the RS232 socket of the electrocardiograph with an RS232 cable.
2. Or if the PC has no RS232 socket, connect the USB socket of the PC to the RS232 socket of the electrocardiograph by using the RS232-USB assembly.

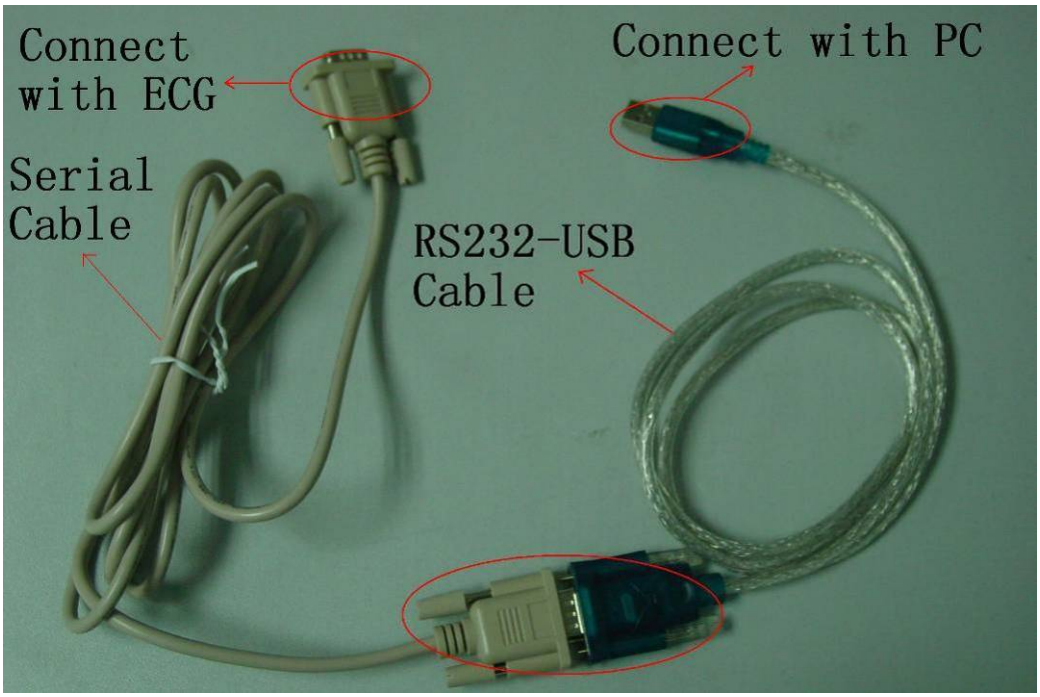


Figure 9-1 RS232-USB Assembly

3. Set **Auto Transmission** to **On** and **Transmission Mode** to **UART** in the Transmission Setup window.

    1) When the main screen is displayed, press the function key **F6** below **Setup** to open the **System Setup screen**.

    2) Press **Tab** or Shift + **Tab**, or the Up, Down, Left or Right arrow to move the cursor to **Transmission**, press ↵ to open the **Transmission Setup window**.

    3) Press **Tab** or Shift + **Tab** to move the cursor to the **Auto Transmission** list box, and then press the Up or Down arrow to select **On**. Press **Tab** or Shift + **Tab** to move the cursor to the **Transmission Mode** list box, and then press the Up or Down arrow to select **UART**.

    4) Press ↵, or press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press ↵.

    5) Press **ESC** to return to the main screen.

4. Log into the Smart ECG Viewer software.

5. In the auto or rhythm mode, ECG data will be transmitted through the serial cable automatically after an ECG report is printed out. In the off mode, ECG data will be transmitted through the serial cable automatically after the **START/STOP** key is pressed.

9.1.2 Transmitting ECG Data in DAT Format through Net Cable

1. Connect the electrocardiograph to the network of the PC with an Ethernet cable recommended by the manufacturer.

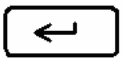
   If the wireless AP transmission is used, connect the PC to the server wireless AP, and connect the electrocardiograph to the client wireless AP. Only the wireless AP recommended by the manufacturer can be used.

   NOTE:

   1. For details on configuring the wireless AP, please refer to the user manual delivered with the wireless AP.
   2. There should be no shield in or around the room where the wireless AP is used, or else the wireless transmission may fail.

2. Set **Auto Transmission** to **On** and **Transmission Mode** to Ethernet in the Transmission Setup window. Set the IP addresses.

   1) When the main screen is displayed, press the function key **F6** below **Setup** to open the **System Setup screen**.

   2) Press **Tab** or Shift + **Tab**, or the Up, Down, Left or Right arrow to move the cursor to **Transmission**, press  to open the **Transmission Setup window**.

   3) Press **Tab** or Shift + **Tab** to move the cursor to the **Auto Transmission** list box, and then press the Up or Down arrow to select **On**.

   4) Press **Tab** or Shift + **Tab** to move the cursor to the **Transmission Mode** list box, and then press the Up or Down arrow to select **Ethernet**.

   5) Press **Tab** or Shift + **Tab** to move the cursor to the **Server IP** item. Set the **Server IP** item to the IP of the PC.

6) Press **Tab** or Shift + **Tab** to move the cursor to the **Local IP** item.

For the cross-network transmission, set the first two sections of the **Local IP** item to the first two sections of the IP of the PC. Set the third section of the **Local IP** item to the network segment of the electrocardiograph which depends on the configuration of Router. The last section of the **Local IP** item can be set at random.

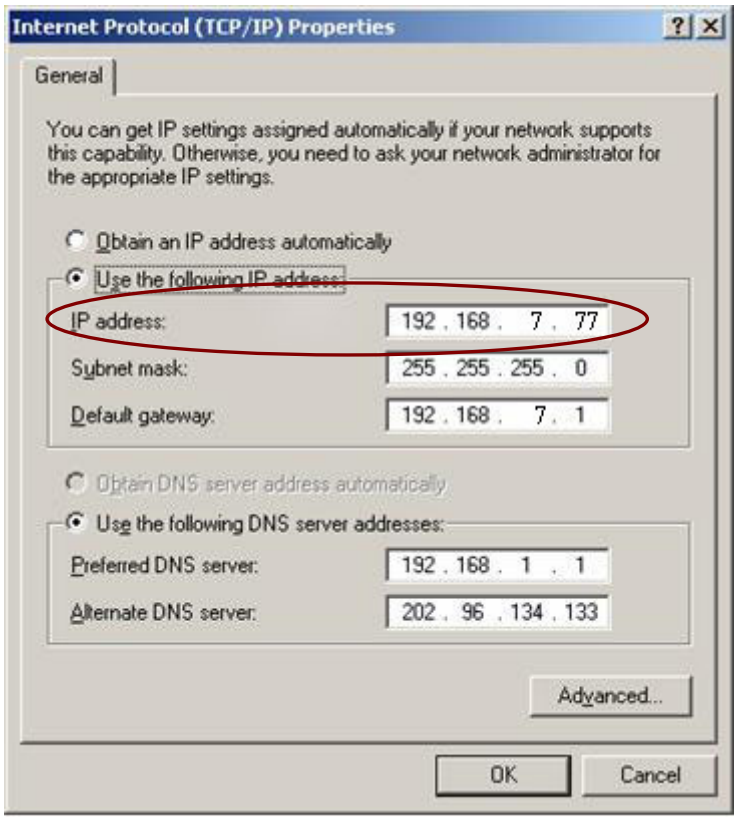
For the same network transmission, set the first three sections of the **Local IP** item to the first three sections of the IP of the PC. The last section of the **Local IP** item can be set at random, but it can't be the same as the last section of the IP of the PC.

7) Press **Tab** or Shift + **Tab** to move the cursor to the **Gateway** item. Set the first three sections of the **Gateway** item to the first three sections of the IP of the electrocardiograph. The last section of the **Gateway** item must be set to **1**.

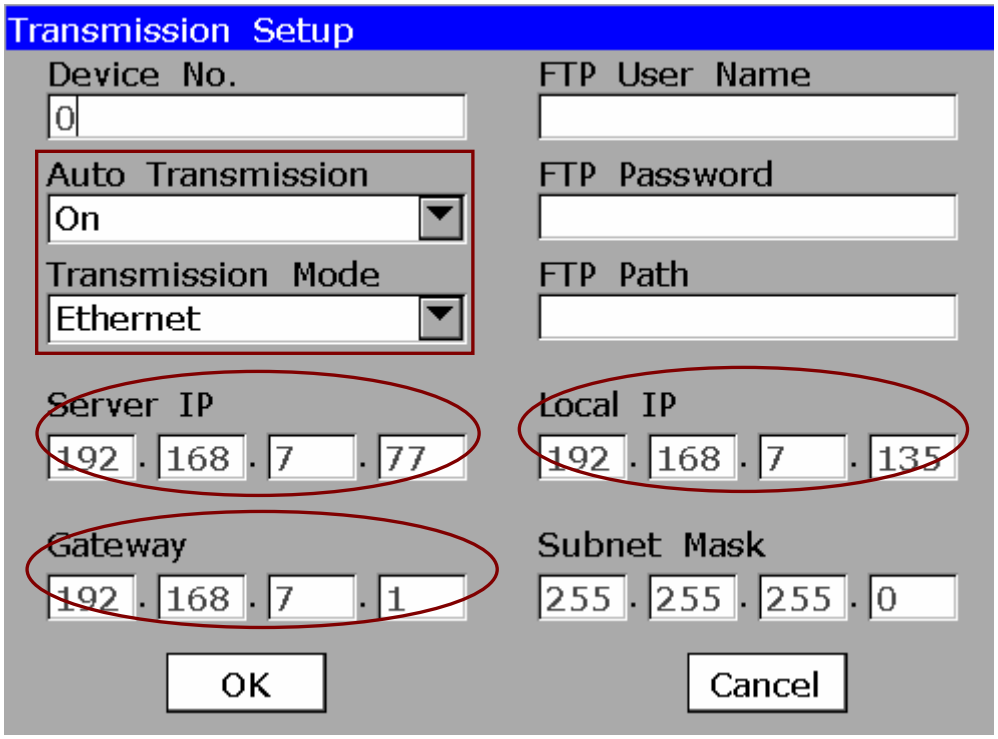
NOTE: For more information on configuring network settings, see your Network Administrator.

Take the same network transmission for example:

View the IP of the PC.


Internet Protocol (TCP/IP) Properties
General
You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.
Obtain an IP address automatically
Use the following IP address:
IP address: 192 . 168 . 7 . 77
Subnet mask: 255 . 255 . 255 . 0
Default gateway: 192 . 168 . 7 . 1
Obtain DNS server address automatically
Use the following DNS server addresses:
Preferred DNS server: 192 . 168 . 1 . 1
Alternate DNS server: 202 . 96 . 134 . 133
Advanced...
OK
Cancel

In the Transmission Setup window of the electrocardiograph, set **Transmission Mode** to **Ethernet**. Set the **Server IP** item to the IP of the PC. Set the first three sections of the **Local IP** item to the first three sections of the IP of the PC. The last section of the **Local IP** item is not the same as the last section of the IP of the PC. Set the first three sections of the **Gateway** item to the first three sections of the IP of the electrocardiograph. The last section of the **Gateway** item must be set to **1**. Commonly, **Subnet Mask** is set to **255.255.255.0**.



8) Press ↵, or press Tab or Shift + Tab to move the cursor to the OK button, and then press ↵.

9) Press ESC to return to the main screen.

3. Log into the Smart ECG Viewer software.

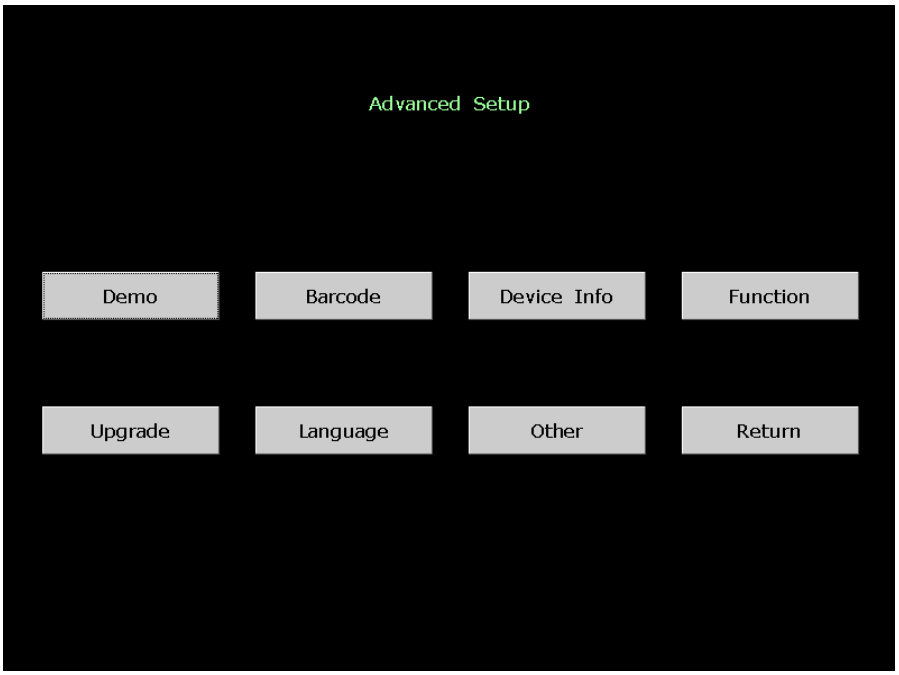
4. In the auto or rhythm mode, ECG data will be transmitted through the net cable automatically after an ECG report is printed out. In the off mode, ECG data will be transmitted through the net cable automatically after the **START/STOP** key is pressed.

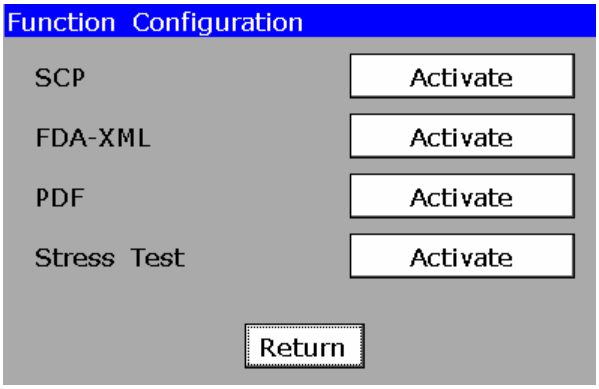
9.1.3 Transmitting ECG Data in SCP/FDA-XML/PDF Format through Net Cable

1. Activate SCP/FDA-XML/PDF function on the **Advanced Setup screen**

   1) When the main screen is displayed, press the function key **F6** below **Setup** to open the **System Setup screen**.

   2) Press **F1** to display the **Service Password** window. Then enter the password and press ↵ to open the **Advanced Setup screen** Press **Tab** or Shift + **Tab**, or the Up, Down, Left or Right arrow to move the cursor to **Function**, and then press ↵ to open the **Function Configuration** window.



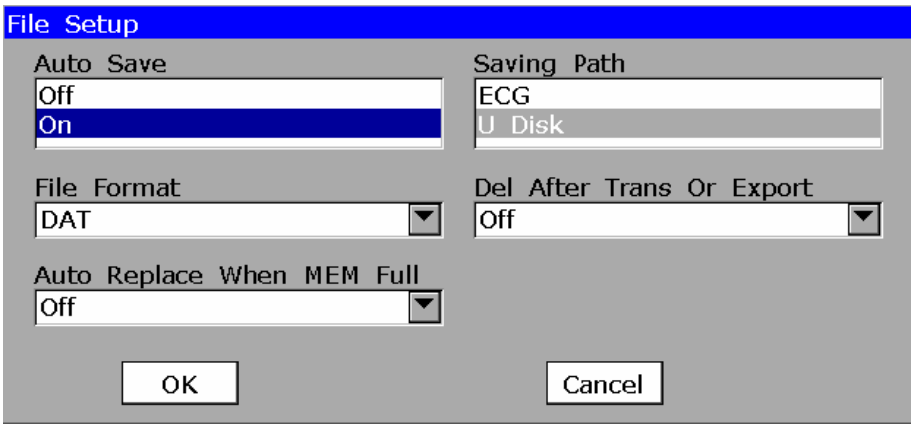


3) Press **Tab** or Shift + **Tab** to move the cursor to the **Activate** button after the function to be activated. Press ↵ to open the **Activate Password** window. Enter the password and press ↵ to activate the function.

NOTE: Please contact local distributors to get the service password and the activating password.

2. Set file format to SCP/FDA-XML/PDF

When the main screen is displayed, press the function key **F6** below **Setup** to open the **System Setup screen**. Press **Tab** or Shift + **Tab**, or the Up, Down, Left or Right arrow to move the cursor to **File**, press ↵ to open the **File Setup window**. Press **Tab** or Shift + **Tab** to move the cursor to **File Format**, and then press the Up or Down arrow to select a format.



3. Transmit ECG data in SCP/FDA-XML/PDF format through the net cable

1) Connect the electrocardiograph to the network of the PC with an Ethernet cable recommended by the manufacturer.

If the wireless AP transmission is used, connect the PC to the server wireless AP, and connect the electrocardiograph to the client wireless AP. Only the wireless AP recommended by the manufacturer can be used.

2) Input the correct FTP path, FTP user name and password. Set **Auto Transmission** to **On** and **Transmission Mode** to **Ethernet**. Set the IP addresses. For details, please refer to Section 9.1.2, “Transmitting ECG Data in DAT Format Through Net Cable”.

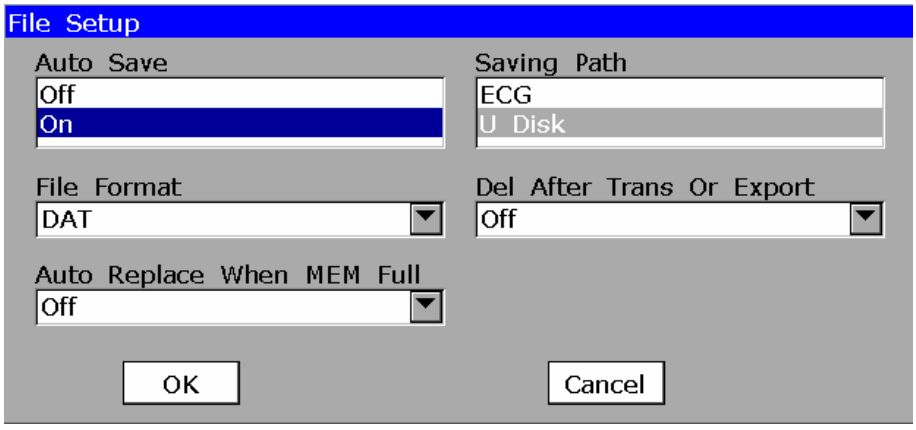
3) Log into the FTP receiving software. The FTP port is 21.
4) In the auto or rhythm mode, ECG data will be transmitted through the net cable automatically after an ECG report is printed out. In the off mode, ECG data will be transmitted through the net cable automatically after the **START/STOP** key is pressed.

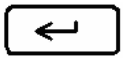
9.2 Exporting ECG Data to the U Disk Automatically

1. Insert the U disk recommended by the manufacturer to USB socket 2 of the electrocardiograph.

2. When the main screen is displayed, press the function key **F6** below **Setup** to open the **System Setup screen**. Press **Tab** or Shift + **Tab**, or the Up, Down, Left or Right arrow to move the cursor to **File**, press to open the **File Setup window**.

3. Press **Tab** or Shift + **Tab** to move the cursor to the **Auto Save** list box, and then press the Up or Down arrow to select **On**. Press **Tab** or Shift + **Tab** to move the cursor to the **Saving Path** list box, and then press the Up or Down arrow to select **U Disk**. Press **Tab** or Shift + **Tab** to move the cursor to **File Format**, and then press the Up or Down arrow to select DAT/SCP/FDA-XML/PDF. For details on activating SCP/FDA-XML/PDF function on the **Advanced Setup screen**, refer to Section 9.1.3, "Transmitting ECG Data in SCP/FDA-XML/PDF Format Through Net Cable".



Press , or press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press  . When the **System Setup screen** is displayed, press **ESC** to return to the main screen.

4. In the auto or rhythm mode, ECG data will be automatically exported to the directory of ECGDATA\ECG-X\Store\Examination Date of the U disk after an ECG report is printed out. In the off mode, ECG data will be automatically exported to the directory of ECGDATA\ECG-X\Store\Examination Date of the U disk after the **START/STOP** key is pressed.

NOTE: X can be set in the **Device No.** textbox in the Transmission Setup window.

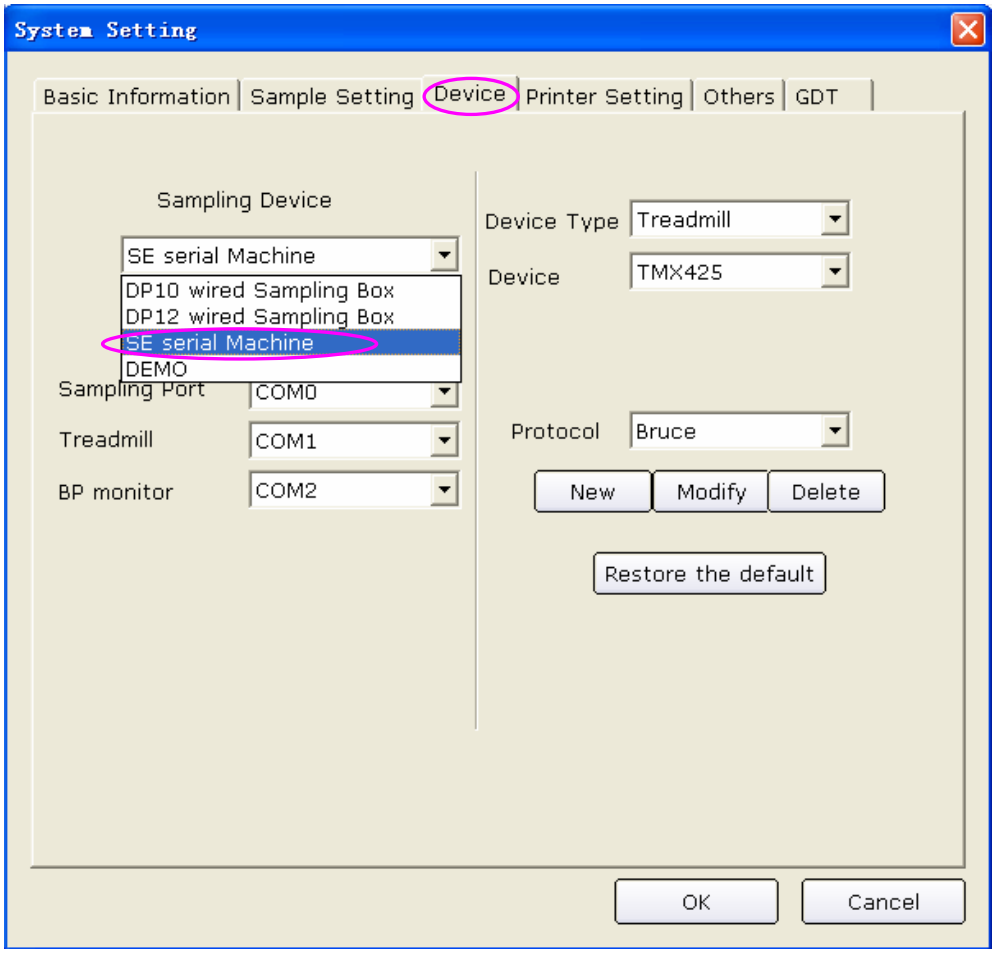
9.3 Real-time Transmission to PC ECG

NOTE: For the real-time transmission, the PC ECG software of the manufacturer must be installed in the PC.

1. Run the PC ECG software and configure it for the real-time transmission.

Double-click on the shortcut icon

on the desktop to start up the PC ECG software. Click on the **System Setting** button to open the System Setting window. Click on the **Device** tab. Select **SE serial Machine** from the **Sampling Device** pull-down list on the device setup window. After setup, click on the **OK** button to confirm.



2. Connect USB socket 1 of the electrocardiograph to the USB socket of the PC by using the high-speed USB cable

3. Start the real-time transmission

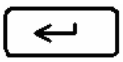
The electrocardiograph transmits to the PC the ECG signals acquired from the patient. Acquisition and transmission are simultaneous. The ECG signals are displayed on the PC monitor and eventually analyzed. For more details, refer to the user manual of the PC ECG software.

In the real-time transmission, the function of the electrocardiograph is the same as that of the ECG sampling box.

Chapter 10 Managing Files

If you want to save the ECG data in the electrocardiograph, you should set **Auto Save** to **On** and **Saving Path** to **ECG**. By default, **Auto Save** is **On** and **Saving Path** is **ECG**. Then the ECG data in the auto, off or rhythm mode will be saved on the **File Manager screen** automatically.

To Set Auto Save to On and Saving Path to ECG

1. When the main screen is displayed, press the function key **F6** below **Setup** to open the **System Setup screen**.
2. Press **Tab** or Shift **+ Tab**, or the Up, Down, Left or Right arrow to move the cursor to **File**, press .
3. Press **Tab** or Shift + **Tab** to move the cursor to the **Auto Save** list box, and then press the Up or Down arrow to select **On**. Press **Tab** or Shift + **Tab** to move the cursor to the **Saving Path** list box, and then press the Up or Down arrow to select **ECG**.
4. Press  , or press **Tab** or Shift **+ Tab** to move the cursor to the **OK** button, and then press .
5. When the **System Setup screen** is displayed, press **ESC** to return to the main screen.

To Switch to the File Manager screen 1/2

When the main screen is displayed, press the function key **F7** below **File** to open the **File Manager screen**1. Press the Up or Down arrow to highlight a file on the **File Manager screen**1, and then press the function key **F4** below **Select** to select the file and display the **File Manager screen**2. Then press the function key **F7** below **Return** to return to the **File Manager screen**1. Press the function key **F7** below **Return** on the **File Manager screen**1 to return to the main screen.

Figure 10-1 File Manager screen1

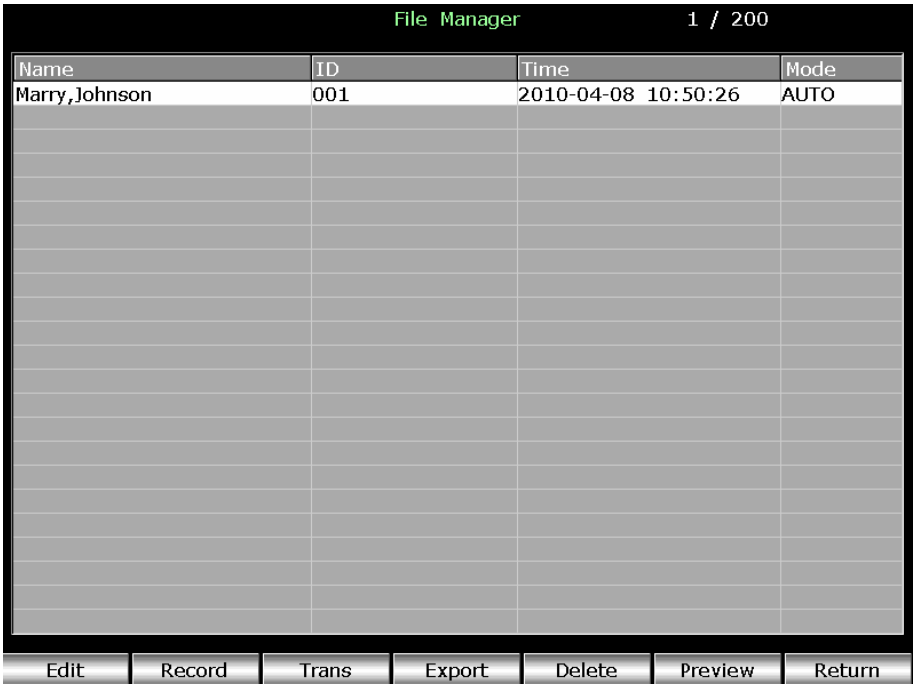


Figure 10-2 File Manager screen2

On the **File Manager screen**, files can be printed, transmitted, exported, displayed, edited searched or deleted. SE-12 can accommodate 100 files, and SE-12 Express can accommodate 200 files.

If there is no file on the **File Manager screen**, the following dialog box will pop up when you press function keys.

CAUTION

1. When files are being printed, transmitted, deleted or exported, you can not turn off the electrocardiograph.
2. Do not cut off the mains supply directly when no battery is installed in the device, or else, the stored data may be lost.

10.1 Transmitting Files to the PC

NOTE:

1. To transmit DAT files to the PC, the Smart ECG Viewer software of the manufacturer must be installed in the PC. You should log into the Smart ECG Viewer software before transmission.
2. To transmit SCP/FDA-XML/PDF files to the PC, the FTP receiving software must be installed in the PC. You should log into the FTP receiving software before transmission.
3. By default, the ECG file format is DAT. You can activate SCP/FDA-XML/PDF function on the **Advanced Setup screen** For details, refer to Section 9.1.3, “Transmitting ECG Data in SCP/FDA-XML/PDF Format Through Net Cable”.
4. If you select **Delete After Trans. Or Export** in the File Setup window, the files will be deleted from the **File Manager screen** after they are transmitted.

CAUTION

It is forbidden to connect or disconnect a U disk or a USB printer during the transmission course.

10.1.1 Transmitting DAT Files through Serial Cable

1. Connect the RS232 socket of the PC to the RS232 socket of the electrocardiograph with an RS232 cable.

2. Or if the PC has no RS232 socket, connect the USB socket of the PC to the RS232 socket of the electrocardiograph by using the RS232-USB assembly. For details of the RS232-USB assembly, please refer to Section 9.1.1, “Transmitting ECG Data in DAT Format Through Serial Cable”.

3. Log into the Smart ECG Viewer software.

NOTE: If you don’t connect the RS232 socket of the electrocardiograph to the PC, or you do not log into Smart ECG Viewer before transmission, the following hint will pop up.

4. Set **Transmission Mode** to **UART** in the Transmission Setup window. For details, refer to Section 9.1.1, “Transmitting ECG Data in DAT Format Through Serial Cable”.

5. Press the function key **F7** below **File** to display the **File Manager screen**1.

6. Press the function key **F1** below **Trans All** to transmit all the files to the PC. After all the files are transmitted, the following hint will pop up.

7. Or press the Up or Down arrow to highlight a file on the **File Manager screen**1, and then press the function key **F4** below **Select** to select the file and display the **File Manager screen**2. Press the function key **F3** below **Trans** to transmit the selected file to the PC.

10.1.2 Transmitting DAT Files through Net Cable

1. Connect the electrocardiograph to the network of the PC with an Ethernet cable recommended by the manufacturer.

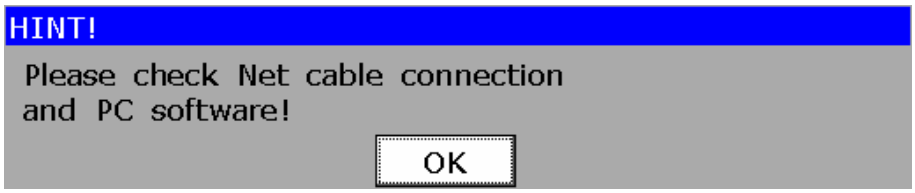
   If the wireless AP transmission is used, connect the PC to the server wireless AP, and connect the electrocardiograph to the client wireless AP. Only the wireless AP recommended by the manufacturer can be used.

   NOTE:

   1. For details on configuring the wireless AP, please refer to the user manual delivered with the wireless AP.
   2. There should be no shield in or around the room where the wireless AP is used, or else the wireless transmission may fail.

2. Log into the Smart ECG Viewer software.

   NOTE: If you don't connect the electrocardiograph to the network of the PC (or if you don't connect the electrocardiograph/PC to the wireless AP), or you do not log into Smart ECG Viewer before transmission, the following hint will pop up.



3. Set **Transmission Mode** to **Ethernet** in the Transmission Setup window. Set the IP addresses. For details on setting the transmission mode and the IP addresses, please see Section 9.1.2, "Transmitting ECG Data in DAT Format Through Net Cable".

4. Press the function key **F7** below **File** to display the **File Manager screen**1.

5. Press the function key **F1** below **Trans All** to transmit all the files to the PC. After all the files are transmitted, the following hint will pop up.

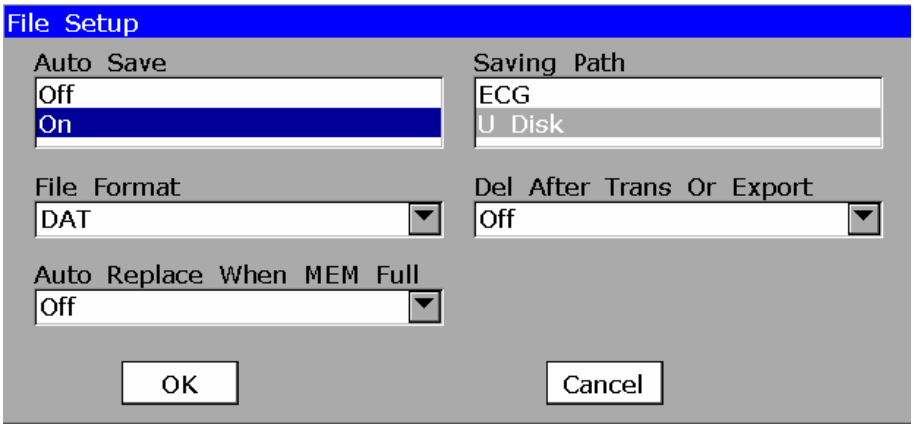
6. Or press the Up or Down arrow to highlight a file on the **File Manager screen**1, and then press the function key **F4** below **Select** to select the file and display the **File Manager screen**2. Press the function key **F3** below **Trans** to transmit the selected file to the PC.

10.1.3 Transmitting SCP/FDA-XML/PDF Files through Net Cable

1. Activate SCP/FDA-XML/PDF function on the **Advanced Setup screen** For details, refer to Section 9.1.3, "Transmitting ECG Data in SCP/FDA-XML/PDF Format Through Net Cable".

2. Set file format to SCP/FDA-XML/PDF

   When the main screen is displayed, press the function key **F6** below **Setup** to open the **System Setup screen**. Press **Tab** or Shift + **Tab**, or the Up, Down, Left or Right arrow to move the cursor to **File**, press to open the **File Setup window**. Press **Tab** or Shift + **Tab** to move the cursor to **File Format**, and then press the Up or Down arrow to select a format.



3. Transmit SCP/FDA-XML/PDF files through the net cable

   1) Connect the electrocardiograph to the network of the PC with an Ethernet cable recommended by the manufacturer.

   If the wireless AP transmission is used, connect the PC to the server wireless AP, and connect the electrocardiograph to the client wireless AP. Only the wireless AP recommended by the manufacturer can be used.

2) Log into the FTP receiving software. The FTP port is 21.

3) Input the correct FTP path, FTP user name and password. Set **Transmission Mode** to **Ethernet**. Set the IP addresses. For details, please see Section 9.1.3, "Transmitting ECG Data in SCP/FDA-XML/PDF Format to the PC Through Net Cable".

4) Press the function key **F7** below **File** to display the **File Manager screen**1.

5) Press the function key **F1** below **Trans All** to transmit all the files to the PC. After all the files are transmitted, the following hint will pop up.

6) Or press the Up or Down arrow to highlight a file on the **File Manager screen**1, and then press the function key **F4** below **Select** to select the file and display the **File Manager screen**2. Press the function key **F3** below **Trans** to transmit the selected file to the PC.

10.2 Exporting Files to the U Disk

1. Insert the U disk recommended by the manufacturer to USB socket 2 of the electrocardiograph.

2. When the main screen is displayed, press the function key **F7** below **File** to open the **File Manager screen**1.

3. Press the function key **F2** below **Export All** to export all the files to the directory of ECGDATA\ECG-X\Export\Examination Date and Time of the U disk.

4. Or press the Up or Down arrow to highlight a file on the **File Manager screen**1, and then press the function key **F4** below **Select** to select the file and display the **File Manager screen**2. Press the function key **F4** below **Export** to export the selected file to the directory of ECGDATA\ECG-X\Export\Examination Date and Time of the U disk.

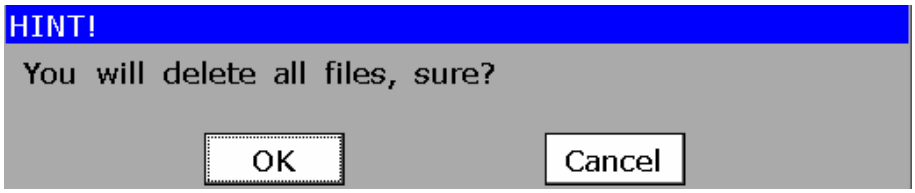
If the U disk is not connected well, the hint *U disk is not ready!* will be displayed on the LCD screen of the electrocardiograph, and then you should connect the U disk again. If the electrocardiograph fails to export files, the hint *Exporting fails!* will pop up. After the electrocardiograph successfully exports files, the hint *Exporting succeeds!* will be displayed.

NOTE:

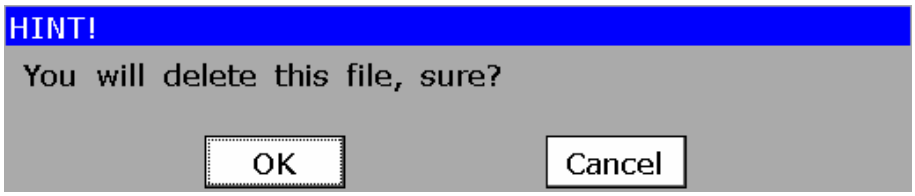
1. Please insert the U disk or the SD card reader recommended by the manufacturer. Please set the format to **FAT** or **FAT32** when formatting the U disk.
2. The format of the exported files can be set to DAT/SCP/FDA-XML/PDF. For details, refer to Section 9.2, “Exporting ECG Data to the U Disk Automatically”.
3. X can be set in the **Device No.** textbox in the Transmission Setup window.
4. If you select **Delete After Trans. Or Export** in the File Setup window, the files will be deleted from the **File Manager screen** after they are exported.

10.3 Deleting Files

1. When the main screen is displayed, press the function key **F7** below **File** to open the **File Manager screen**1.
2. Press the function key **F3** below **Del All** to display the following hint, press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press ↵ to delete all the files from the electrocardiograph.



3. Or press the Up or Down arrow to highlight a file on the **File Manager screen**1, and then press the function key **F4** below **Select** to select the file and display the **File Manager screen**2. Press the function key **F5** below **Delete** to display the following hint, press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press ↵ to delete the selected file from the electrocardiograph.

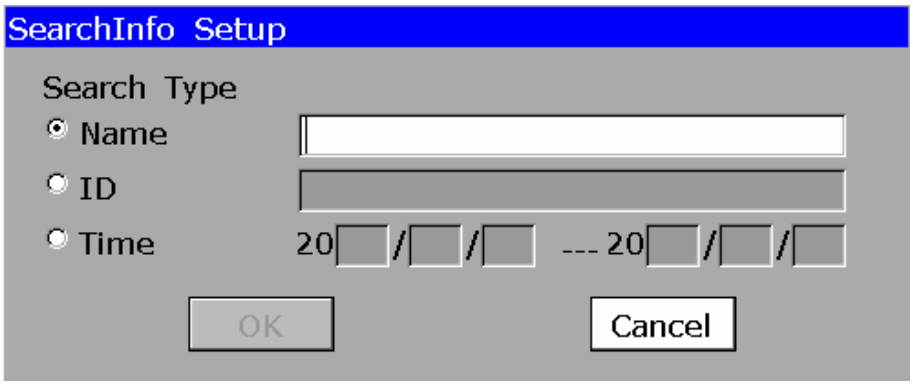


10.4 Searching Files

To Open the SearchInfo Setup Window

1. When the main screen is displayed, press the function key **F7** below **File** to open the **File Manager screen**1.

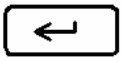
2. Press the function key **F5** below **Search** to open the **SearchInfo Setup** window.



To Search Files

1. Press **Tab**, Shift + **Tab**, or the Up or Down arrow to select **Name**, and then input the patient name. Press ↵, or press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press ↵. Then all the files with the input patient name will be displayed on the **File Manager screen**1.

2. Press **Tab**, Shift + **Tab**, or the Up or Down arrow to select **ID**, and then input the patient ID. Press ↵, or press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press ↵. Then all the files with the input patient ID will be displayed on the **File Manager screen**1.

3. Press **Tab**, Shift + **Tab**, or the Up or Down arrow to select **Time**, and then input the examination time range. Press , or press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press  . Then all the corresponding files from the start time to the end time will be displayed on the **File Manager screen**1.

NOTE: The time mode is year-month-day in the SearchInfo Setup window.

10.5 Importing Files

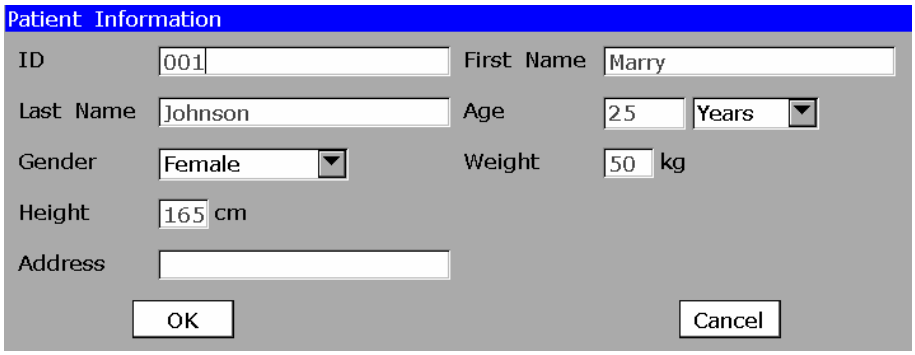
1. Insert the U disk recommended by the manufacturer to USB socket 2 of the electrocardiograph.
2. When the main screen is displayed, press the function key **F7** below **File** to open the **File Manager screen**1.
3. Press the function key **F6** below **Import** to import files from the directory of ECGDATA/ECG-X/Import of the U disk to the electrocardiograph.

NOTE:

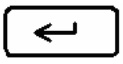
1. X can be set in the **Device No.** textbox in the Transmission Setup window.
2. Only the ECG files in DAT format produced by the electrocardiograph of the manufacturer can be imported.
3. For SE-12, a maximum of 100 files can be imported at one time. For SE-12 Express, a maximum of 200 files can be imported at one time.

10.6 Editing Patient Information

When the main screen is displayed, press the function key **F7** below **File** to open the **File Manager screen**1. Press the Up or Down arrow to highlight a file on the **File Manager screen**1, and then press the function key **F4** below **Select** to select the file and display the **File Manager screen**2. Press the function key **F1** below **Edit** to open the **Patient Information** window.



NOTE: The **Address** item is customized.

1. Press **Tab** or Shift + **Tab** to move the cursor to a textbox. Fill in the selected textbox.
2. Press **Tab** or Shift + **Tab** to move the cursor to a list box. Press the Up or Down arrow to select an option.
3. After inputting all the information, press  to confirm; or press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press to confirm.

For details on inputting data, please refer to Section 3.2, "Entering Data".

10.7 Printing Files

When the main screen is displayed, press the function key **F7** below **File** to open the **File Manager screen**1. Press the Up or Down arrow to highlight a file on the **File Manager screen**1, and then press the function key **F4** below **Select** to select the file and display the **File Manager screen**2. Press **START/STOP** or the function key **F2** below **Record** to print the selected file. Pressing **START/STOP** or the function key **F2** below **Stop** can stop printing the file.

10.8 Previewing a File

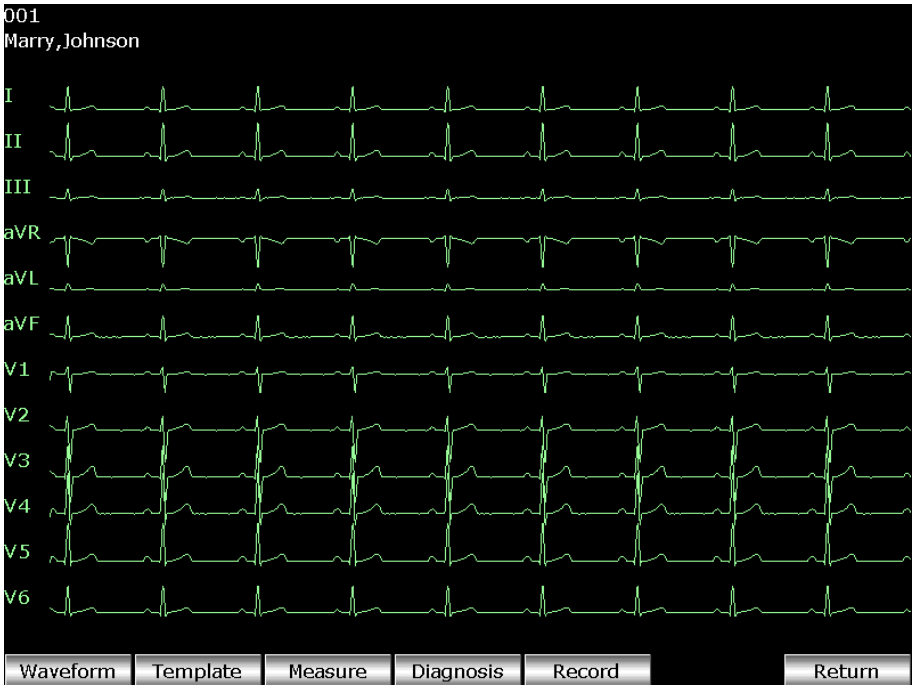
To Open the File preview screen

1. When the main screen is displayed, press the function key **F7** below **File** to open the **File Manager screen**1.
2. Press the Up or Down arrow to highlight a file on the **File Manager screen**1, and then press the function key **F4** below **Select** to select the file and display the **File Manager screen**2.

3. Press the function key **F6** below **Preview** to open the file preview screen.

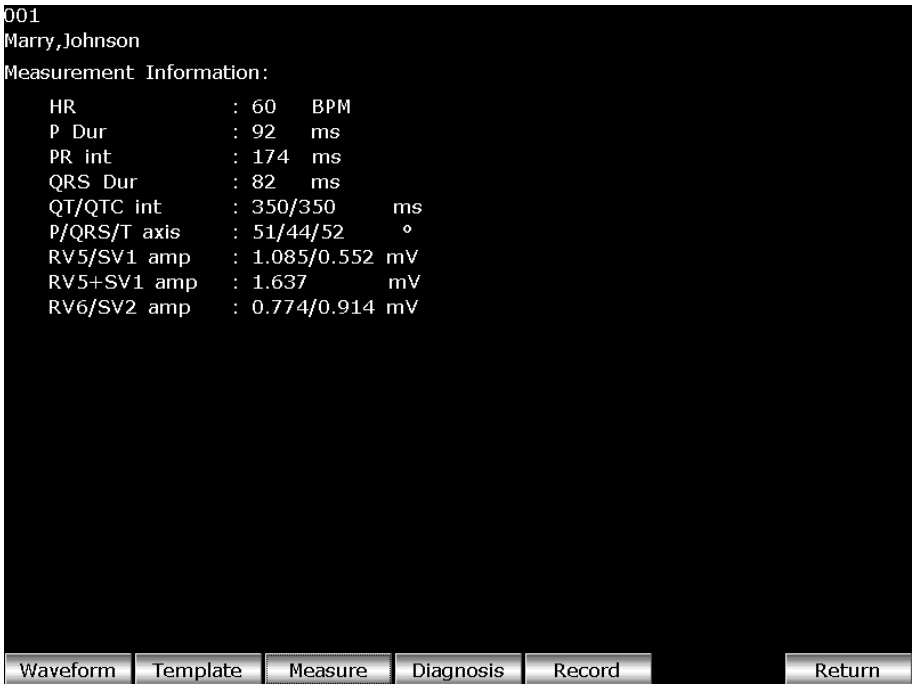
To Preview the File

1. Press the function key **F1** below **Waveform** to display the waveform screen.

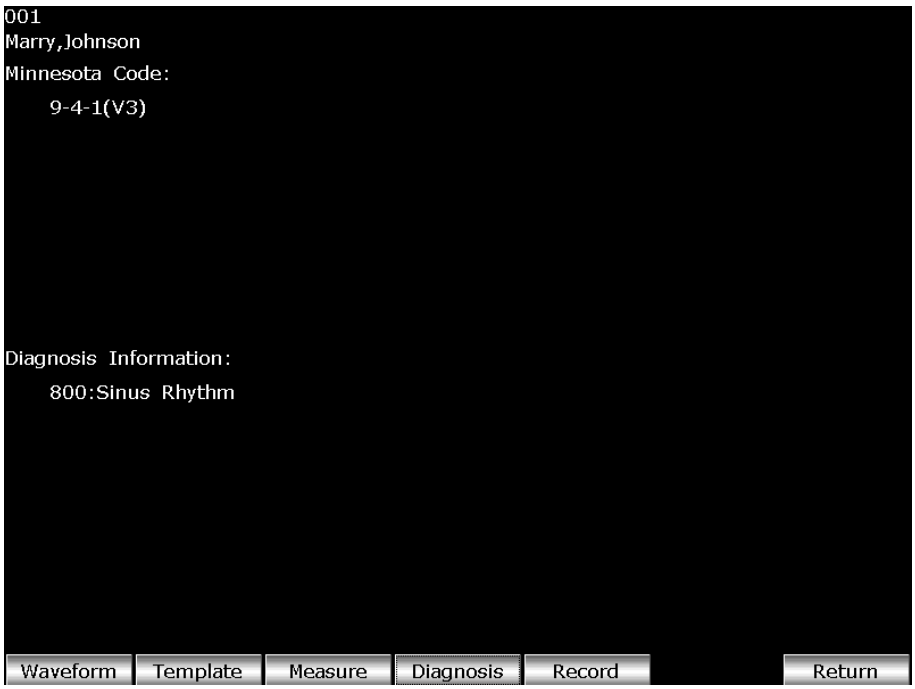


2. Press the function key **F2** below **Template** to display the template screen.

3. Press the function key **F3** below **Measure** to display the measure screen which shows Patient Name, Patient ID, Heart Rate, P Duration, PR interval, QRS Duration, QT/QTC interval, P/QRS/T axis, RV5/SV1 amplitude, RV5+SV1 amplitude, and RV6/SV2 amplitude.



4. Press the function key **F4** below **Diagnosis** to show Minnesota Code and Diagnosis Information.



5. Press **START/STOP** or the function key **F5** below **Record** to print the file. Pressing **START/STOP** or the function key **F5** below **Stop** can stop printing the file.

6. Press the function key **F7** below **Return** to return to the **File Manager screen**2.

NOTE: Rhythm data can not be previewed.

Chapter 11 System Setup

After you turn on the device, the main screen pops up. Press the function key **F6** below **Setup** to display the **System Setup screen**.

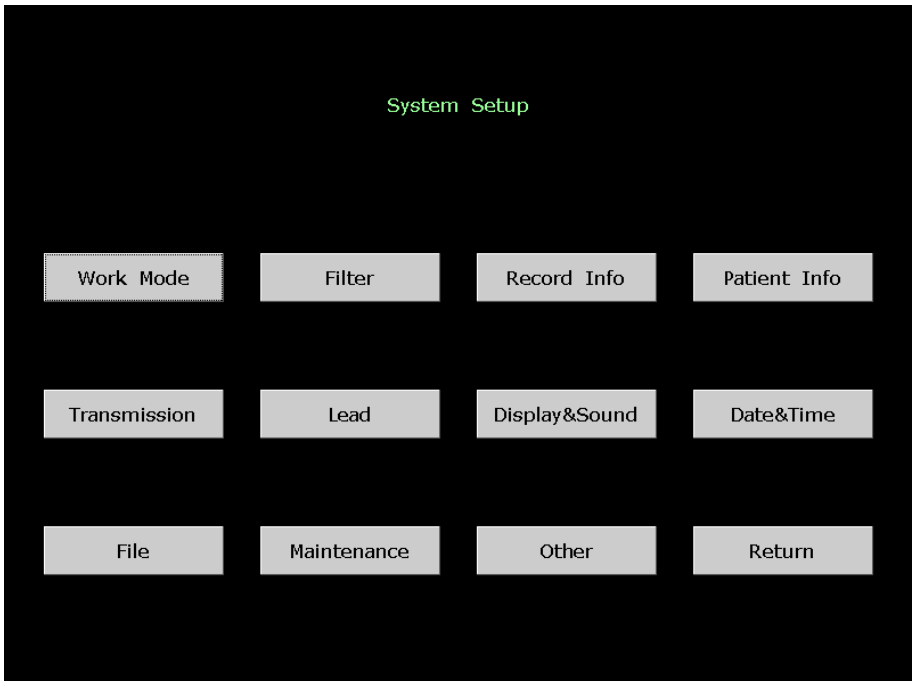


Figure 11-1 System Setup screen

After setup,

1. Press **ESC** to return to the main screen.
2. Or press **Tab** or Shift + **Tab**, or the Up, Down, Left or Right arrow to move the cursor to **Return**, and then press ↵ to return to the main screen.

11.1 Work Mode Setup

When the cursor is on **Work Mode** on the **System Setup screen**, press ↵ to open the **Work Mode Setup window**.

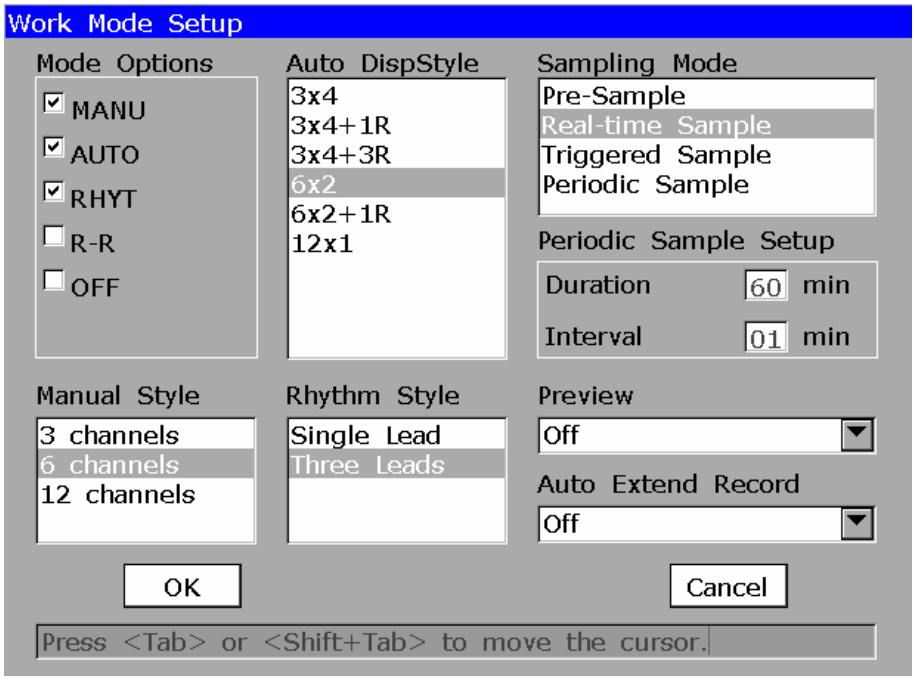


Figure 11-2 Work Mode Setup window

After setup, press ↵ to confirm, or press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press ↵ to confirm. Then the **System Setup screen** appears.

11.1.1 Selecting Work Mode

Press **Tab** or Shift + **Tab** to move the cursor to a work mode, press Spacebar to select it, and then a check mark √ appears in the box before the work mode.

NOTE: Only if a work mode is selected in the Work Mode Setup window, can the work mode be selected by pressing the **MODE** key when the main screen is displayed.

MANU: In the manual mode, you can determine the lead group to be displayed and printed.

AUTO: In the auto mode, the lead groups are switched automatically according to the lead sequence during the printing course. After the ECG waves of one lead group are printed within a certain time, the system switches to print ECG waves of another lead group automatically.

RHYT: In the rhythm mode, you can select rhythm leads to print 60s or 20s rhythm-lead ECG waves.

R-R: In the R-R analysis mode, you can select a lead to print its R-R histogram, R-R trend chart, 180s compressed ECG waveform and all the R-R interval values.

OFF: In the off mode, the lead groups are switched automatically according to the lead sequence. When the main screen is displayed, after pressing the **START/STOP** key, the sampled ECG data can be saved and transmitted, but can not be printed.

11.1.2 Selecting Manual Style

Press **Tab** or Shift + **Tab** to move the cursor to the **Manual Style** list box in the Work Mode Setup window, and then press the Up or Down arrow to highlight **3 channels**, **6 channels** or **12 channels**.

When **Manual Style** is set to **3 channels**, ECG waves of 3 leads are displayed and printed in the manual mode.

When **Manual Style** is set to **6 channels**, ECG waves of 6 leads are displayed and printed in the manual mode.

When **Manual Style** is set to **12 channels**, ECG waves of 12 leads are displayed and printed in the manual mode.

11.1.3 Selecting Rhythm Style

Press **Tab** or Shift + **Tab** to move the cursor to the **Rhythm Style** list box in the Work Mode Setup window, and then press the Up or Down arrow to highlight **Single Lead** or **Three Leads**.

When **Rhythm Style** is set to **Single Lead**, in the rhythm mode, 60s ECG waves of the appointed single rhythm lead will be printed.

When **Rhythm Style** is set to **Three Leads**, in the rhythm mode, 20s ECG waves of three appointed rhythm leads will be printed.

11.1.4 Selecting Auto Display Style

Press **Tab** or Shift + **Tab** to move the cursor to the **Auto DispStyle** list box in the Work Mode Setup window, and then press the Up or Down arrow to highlight an option.

When the auto display style is set to **3×4**, ECG waves of 12 leads are displayed in 4 groups of 3.

When the auto display style is set to **3×4+1R**, ECG waves of 12 leads are displayed in 4 groups of 3, with the ECG wave of one rhythm lead on the bottom.

When the auto display style is set to **3×4+3R**, ECG waves of 12 leads are displayed in 4 groups of 3, with ECG waves of three rhythm leads on the bottom.

When the auto display style is set to **6×2**, ECG waves of 12 leads are displayed in 2 groups of 6.

When the auto display style is set to **6×2+1R**, ECG waves of 12 leads are displayed in 2 groups of 6, with the ECG wave of one rhythm lead on the bottom.

When the auto display style is set to **12×1**, ECG waves of 12 leads are displayed on one screen simultaneously.

11.1.5 Selecting Sampling Mode

Press **Tab** or Shift + **Tab** to move the cursor to the **Sampling Mode** list box in the Work Mode Setup window, and then press the Up or Down arrow to highlight an option.

When **Sampling Mode** is set to **Pre-Sample**, 10s ECG data sampled before pressing the **START/STOP** key will be printed out.

NOTE: When **Sampling Mode** is set to **Pre-Sample**, if you press the **START/STOP** key before the electrocardiograph samples for 10s, the recorder will not respond.

When **Sampling Mode** is set to **Real-time Sample**, 10s ECG data sampled after pressing the **START/STOP** key will be printed out.

When **Sampling Mode** is set to **Triggered Sample**, after pressing the **START/STOP** key, if Arrhythmia ECG data, including Asystole, Ventricular Fibrillation/Ventricular Tachycardia, 5>PVCS>=3, Paired PVCS, Bigeminy, Trigeminy, R ON T, single PVC and Missed Beat, is detected during the learning course, the printing will be triggered automatically.

When **Sampling Mode** is set to **Periodic Sample**, first you should set **Duration** and **Interval**. For example, if **Interval** is set to **2 min**, and **Duration** is set to **24 min**, after pressing the **START/STOP** key, the printing will be performed every two minutes and come to 12 times.

NOTE:

1. There is no saving, exporting or transmitting in the **Periodic Sample** mode.
2. ID and patient information will not be changed while carrying out the periodic printing.

11.1.6 Setting Interval and Duration

Press **Tab** or Shift + **Tab** to move the cursor to the **Duration** and **Interval** textboxes in the Work Mode Setup window, and then input the duration and the interval manually.

In the auto mode, when **Sampling Mode** is set to **Periodic Sample**, if **Interval** is set to **2 min**, **Duration** is set to **24 min**, after pressing the **START/STOP** key, the printing will be performed every two minutes and come to 12 times.

11.1.7 Selecting Preview Function

Press **Tab** or Shift + **Tab** to move the cursor to **Preview** in the Work Mode Setup window, and then press the Up or Down arrow to highlight **Off** or **On**.

When **Preview** is set to **On**, the preview screen will appear after you press the **START/STOP** key in the auto or off mode.

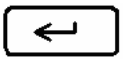
When **Preview** is set to **Off**, the preview screen will not appear after you press the **START/STOP** key.

11.1.8 Selecting Auto Extend Record

Press **Tab** or Shift + **Tab** to move the cursor to **Auto Extend Record** in the Work Mode Setup window, and then press the Up or Down arrow to highlight **Off** or **On**.

When **Auto Extend Record** is set to **On**, if arrhythmia is detected in the auto or off mode, a hint will pop up to ask you whether to print an extra rhythm report after the 12-lead ECG report.

11.2 Filter Setup

Press **Tab** or Shift + **Tab**, or the Up, Down, Left or Right arrow to move the cursor. When the cursor is on **Filter** on the **System Setup screen**, press  to open the **Filter Setup window**.

In the Filter Setup window, you can set **AC Filter**, **EMG Filter**, **DFT Filter**, and **Lowpass Filter**.

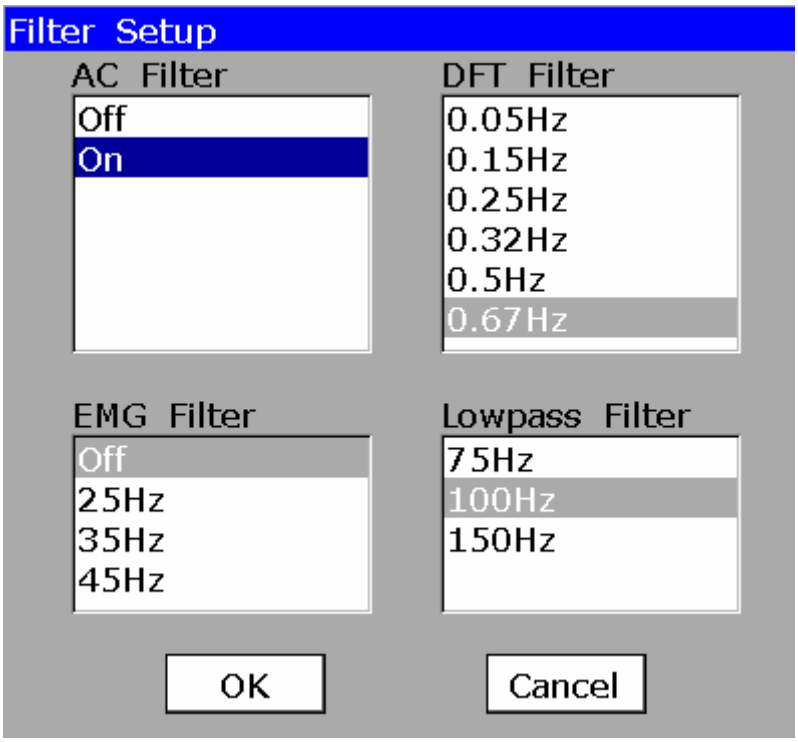


Figure 11-3 Filter Setup window

After setup, press ↵ to confirm, or press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press ↵ to confirm. Then the **System Setup screen** appears.

11.2.1 Setting AC Filter

Press **Tab** or Shift + **Tab** to move the cursor to the **AC Filter** list box in the Filter Setup window. Press the Up or Down arrow to highlight **Off** or **On**.

AC Filter suppresses AC interference without attenuating or distorting the ECG signals. Select **On** to turn on the function and select **Off** to turn it off.

NOTE: AC frequency can be set to **50Hz** or **60Hz** on the **Advanced Setup screen** according to local mains supply specifications.

11.2.2 Setting DFT Filter

Press **Tab** or Shift + **Tab** to move the cursor to the **DFT Filter** list box in the Filter Setup window. Press the Up or Down arrow to highlight an option.

DFT Filter greatly reduces the baseline fluctuations without affecting the ECG signals. The purpose of this filter is to keep the ECG signals on the baseline of the printout. The set value is the low limit of the frequency range, including **0.05Hz**, **0.15Hz**, **0.25Hz**, **0.32Hz**, **0.5Hz** and **0.67Hz**.

11.2.3 Setting EMG Filter

Press **Tab** or Shift + **Tab** to move the cursor to the **EMG Filter** list box in the Filter Setup window. Press the Up or Down arrow to highlight an option.

EMG Filter suppresses disturbance caused by strong muscle tremor. The cutoff frequency can be set to **25Hz**, **35Hz** or **45Hz**. Select **Off** to turn off the function.

11.2.4 Setting Lowpass Filter

Press **Tab** or Shift + **Tab** to move the cursor to the **Lowpass Filter** list box. Press the Up or Down arrow to highlight an option.

Lowpass Filter restricts the bandwidth of input signals. The cutoff frequency can be set to **150Hz**, **100Hz** or **75Hz**. All the input signals whose frequency is higher than the set cutoff frequency will be attenuated.

NOTE:

1. Only when **EMG Filter** is set to **Off**, can the setting of **Lowpass Filter** be effective.
2. To the patient with a pacemaker, the EMG filter should be set to **Off** and the Lowpass filter should be set to **150Hz**; or else, the amplitude of the pulses may decrease, the width may increase, and the diagnosis results may not include the pacemaker information.

11.3 Record Info Setup

Press **Tab** or Shift + **Tab**, or the Up, Down, Left or Right arrow to move the cursor. When the cursor is on **Record Info** on the **System Setup screen**, press ↵ to open the **Record Info Setup window**.

You can press **F1** or **F2** to switch between **Setup 1** and **Setup 2**.

After setup, press ↵ to confirm, or press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press ↵ to confirm. Then the **System Setup screen** appears.

11.3.1 Setup 1

Press **F1** or **F2** to switch to the **Setup 1 tab**.

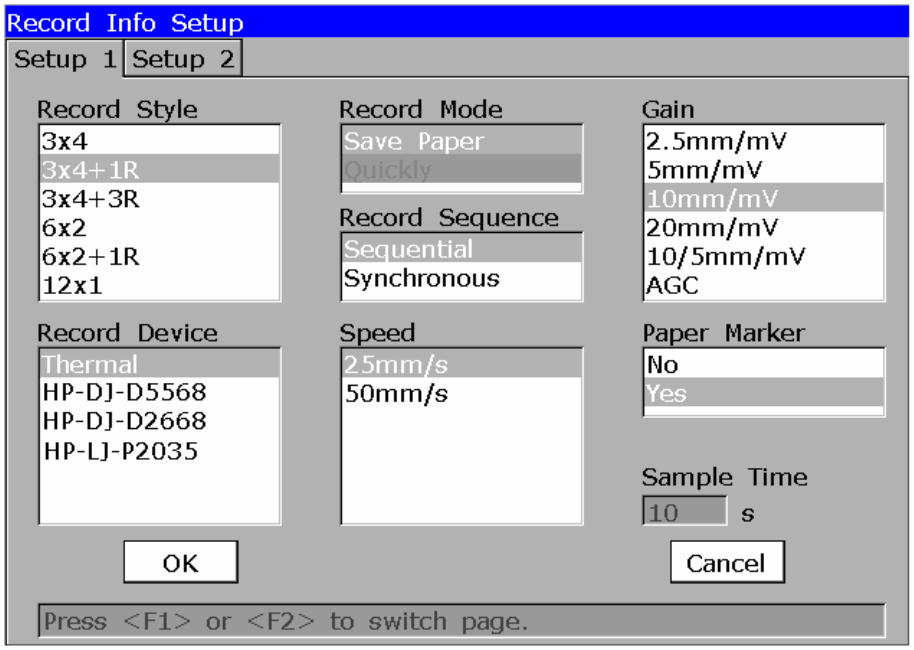


Figure 11-4 Record Info Setup1

11.3.1.1 Selecting Auto Recording Style

Press **Tab** or Shift + **Tab** to move the cursor to the **Record Style** list box on the **Setup 1 tab**, and then press the Up or Down arrow to highlight an option.

In the auto mode, when **Record Style** is set to **3×4**, ECG waves of 12 leads are printed in 4 groups of 3.

In the auto mode, when **Record Style** is set to **3×4+1R**, ECG waves of 12 leads are printed in 4 groups of 3, with the ECG wave of one rhythm lead on the bottom of the ECG reports.

In the auto mode, when **Record Style** is set to **3×4+3R**, ECG waves of 12 leads are printed in 4 groups of 3, with the ECG waves of three rhythm leads on the bottom of the ECG reports.

In the auto mode, when **Record Style** is set to **6×2**, ECG waves of 12 leads are printed in 2 groups of 6.

In the auto mode, when **Record Style** is set to **6×2+1R**, ECG waves of 12 leads are printed in 2 groups of 6, with the ECG wave of one rhythm lead on the bottom of the ECG reports.

In the auto mode, when **Record Style** is set to **12×1**, ECG waves of 12 leads are printed simultaneously.

11.3.1.2 Selecting Recording Mode

Press **Tab** or Shift + **Tab** to move the cursor to the **Record Mode** list box on the **Setup 1 tab**, and then press the Up or Down arrow to highlight **Save Paper** or **Quickly**.

When **Record Mode** is set to **Save Paper**, 10s after pressing the **START/STOP** key on the main screen, an ECG report is printed. The patient information, measure information, interpretation and ECG waves are printed on the same paper.

When **Record Mode** is set to **Quickly**, pressing the **START/STOP** key on the main screen to begin printing an ECG report immediately, the patient information, measure information, interpretation and ECG waves are printed on two pieces of paper.

NOTE:

1. In the auto mode, only when **Sampling Mode** is set to **Real-time Sample**, **Quickly** is available.
2. When **Record Style** is set to **3×4**, **3×4+1R** or **3×4+3R**, only **Save Paper** is available. When **Record Style** is set to **12×1,** only **Quickly** is available.

11.3.1.3 Selecting Recording Sequence

Press **Tab** or Shift + **Tab** to move the cursor to the **Record Sequence** list box on the **Setup 1 tab**, and then press the Up or Down arrow to highlight **Sequential** or **Synchronous**.

When **Record Sequence** is set to **Sequential**, the lead group is printed one by one in a certain sequence. The start time of a lead group is just the end time of the previous lead group.

When **Record Sequence** is set to **Synchronous**, all leads are printed simultaneously. The start time of each group is the same.

11.3.1.4 Setting Gain

Press **Tab** or Shift + **Tab** to move the cursor to the **Gain** list box on the **Setup 1 tab**, and then press the Up or Down arrow to highlight an option.

You can set the indicated height of 1mV ECG on the paper.

You can set **Gain** to **10mm/mV**, **20mm/mV**, **10/5mm/mV**, **AGC**, **2.5mm/mV** or **5mm/mV**.

AGC means auto gain control. When ECG signals vary greatly, **AGC** can be selected to adjust the gain automatically according to actual signals.

10/5mm/mV means that the gain of limb leads is set to **10mm/mV**, while the gain of chest leads is set to **5mm/mV**.

11.3.1.5 Selecting Recording Device

Press **Tab** or Shift + **Tab** to move the cursor to the **Record Device** list box on the **Setup 1 tab**. Press the Up or Down arrow to select an option.

You can set **Record Device** to **Thermal**, **HP-DJ-D2468**, **HP-DJ-D5568**, **HP-DJ-D2668**, **HP-DJ-D4368** or **HP-LJ-P2035**.

HP-DJ-D2468, **HP-DJ-D5568**, **HP-DJ-D2668**, **HP-DJ-D4368** and **HP-LJ-P2035** are the types of the USB printer, when **HP-DJ-D2468**, **HP-DJ-D5568**, **HP-DJ-D2668**, **HP-DJ-D4368** or **HP-LJ-P2035** is selected, you should connect the corresponding USB printer to USB socket 2 of the electrocardiograph with a special cable. Press the **START/STOP** key to print ECG reports by using the USB printer.

WARNING

If the printer used is not the type listed above, additional safety measures (such as applying an isolation transformer to supply the medical system) should be taken when the safety of the medical system has not been evaluated. If in doubt, consult our technical service department or your local distributor

Options	Corresponding USB Printers
HP-DJ-D2468	HP Deskjet 3938
	HP Deskjet D2368
	HP Deskjet D2468
HP-DJ-D5568	HP Deskjet D2568
	HP Deskjet D5568
HP-LJ-P2035	HP Laserjet P2015
	HP Laserjet P2035

NOTE:

1. During the USB printing course，pressing the **START/STOP** key again can not stop printing ECG reports.
2. For details of the ECG report printed by the USB printer, please refer to Section 8.6.5, “ECG Reports Printed by the USB Printer”.
3. USB printing is ineffective in the auto periodic sampling mode, auto 11~24s sampling mode, manual mode and R-R analysis mode.
4. Make sure that paper is installed in the USB printer before printing. Error may occur if no paper is loaded in the USB Printer.

CAUTION

It is forbidden to frequently connect or disconnect the U disk or the USB printer.

11.3.1.6 Setting Speed

Press **Tab** or Shift + **Tab** to move the cursor to the **Speed** list box on the **Setup 1 tab**, and then press the Up or Down arrow to highlight an option.

In the manual mode, you can set **Speed** to **5mm/s**, **6.25mm/s**, **10mm/s**, **12.5mm/s**, **25mm/s** or **50mm/s**. In the auto and rhythm modes, only **25mm/s** and **50mm/s** are available. In the R-R analysis mode, only **25mm/s** is available.

11.3.1.7 Selecting Paper Marker

Press **Tab** or Shift + **Tab** to move the cursor to the **Paper Marker** list box on the **Setup 1 tab**, and then press the Up or Down arrow to highlight **No** or **Yes**.

Paper Marker is used to identify the start point of each page of the recorder paper.

When the paper with black markers on the bottom is used and **Paper Marker** is set to **Yes**, the device can identify the start point of each page of the recorder paper while printing ECG reports.

When **Paper Marker** is set to **No**, the device can not identify the start point of each page of the recorder paper while printing ECG reports.

11.3.1.8 Setting Sampling Time

If **Record Style** is set to **12x1**, you can set the time period. Press **Tab** or Shift + **Tab** to move the cursor to the **Sample Time** textbox, and then input the time period manually.

If the time period is set from 11 to 24 seconds, in the auto mode, after pressing the **START/STOP** key, the ECG waves of the set time period are printed.

NOTE: If the time period is set from 11 to 24 seconds, the ECG data sampled will not be analyzed automatically or stored.

11.3.2 Setup 2

Press **F1** or **F2** to switch to the **Setup 2 tab**.

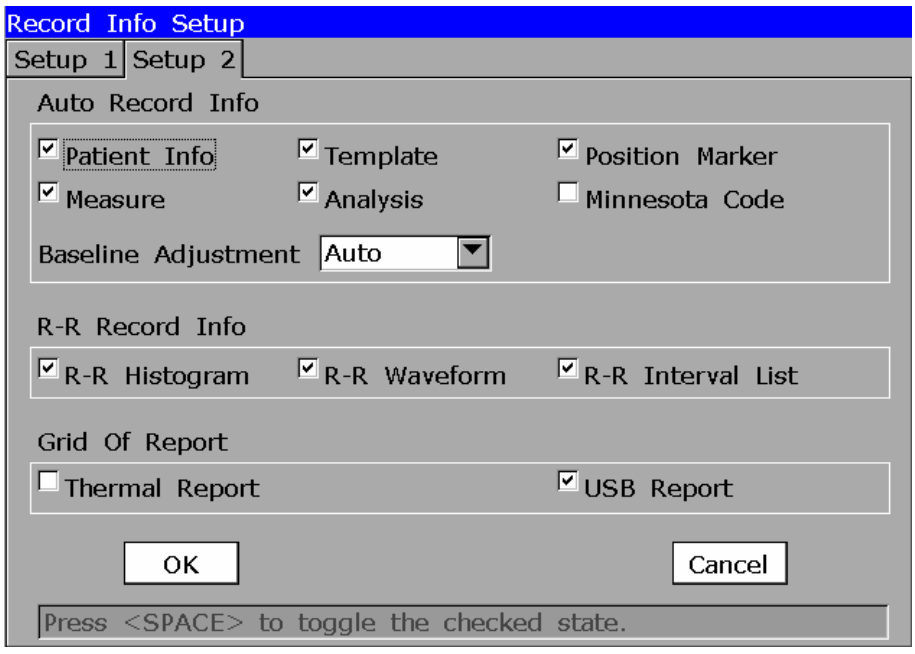


Figure 11-5 Record Info Setup2

Press **Tab** or Shift + **Tab** to move the cursor to an item, and then press Spacebar to select or deselect the item.

Auto Record Info includes **Patient Info**, **Position Marker**, **Analysis**, **Template**, **Measure**, **Minnesota Code** and **Baseline Adjustment**.

When **Patient Info**, **Position Marker**, **Analysis**, **Template**, **Measure** or **Minnesota Code** is selected, it will be printed in the ECG reports.

When **Baseline Adjustment** is set to **Auto**, the baselines of the lead groups are adjusted respectively.

When **Baseline Adjustment** is set to **Horizontal**, the baselines of the lead groups are adjusted simultaneously, and the baselines of the leads in the same row are on the same line.

R-R Record Info includes **R-R Histogram**, **R-R Waveform** and **R-R Interval List**.

When **R-R Histogram**, **R-R Waveform** or **R-R Interval List** is selected, it will be printed in the ECG reports.

Grid of Report includes **Thermal Report** and **USB Report**.

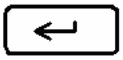
When **Thermal Report** is selected, the grid will be printed while printing ECG reports with the thermal recorder.

When **USB Report** is selected, the grid will be printed while printing ECG reports with a USB printer.

NOTE:

1. The items of **Auto Record Info** are available only in the auto mode, and Template and Position Marker do not work in the auto style of 3×4, 3×4+1R and 3×4+3R, and the style of 6x2 and 6x2+1R in the **Save Paper** mode.
2. To get more information about the above contents, please refer to Section 8.6.1, “ECG Reports in the Auto Mode”.

11.4 Patient Information Setup

Press **Tab** or Shift + **Tab**, or the Up, Down, Left or Right arrow to move the cursor. When the cursor is on **Patient Info** on the **System Setup screen**, press  to open the **Patient Information Setup window**.

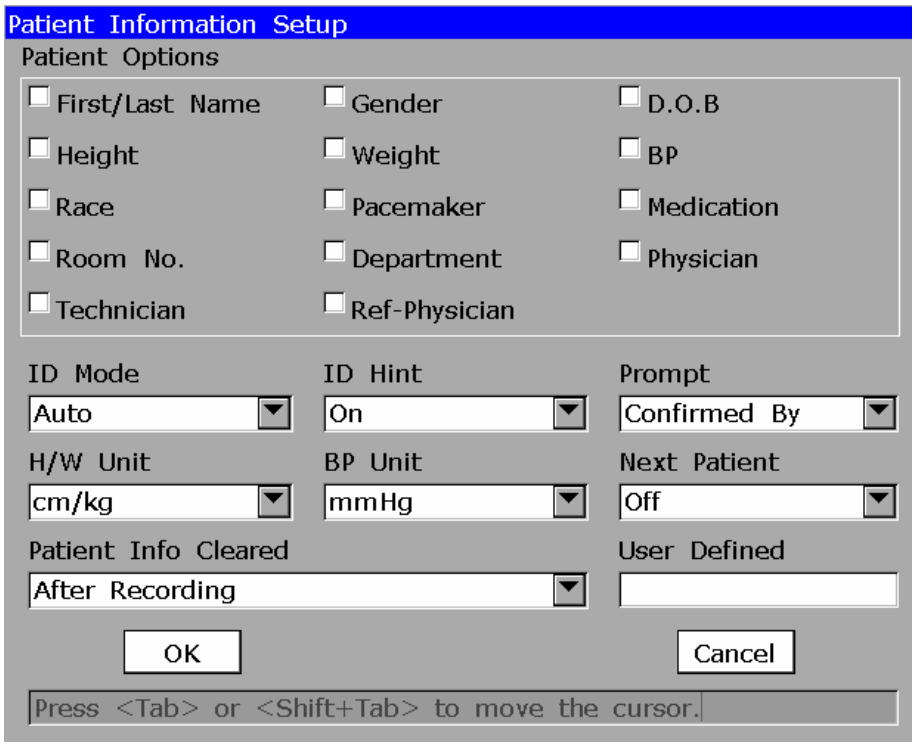


Figure 11-6 Patient Information Setup window

After setup, press ↵ to confirm, or press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press ↵ to confirm. Then the **System Setup screen** appears.

11.4.1 Selecting First/Last Name / Gender / D.O.B / Height / Weight / BP / Race / Pacemaker / Medication / Room No. / Department / Physician / Technician / Ref-Physician

Press **Tab** or Shift + **Tab** to move the cursor to an item in the Patient Information Setup window, and then press Spacebar to select or deselect the item.

When **First/Last Name**, **Gender**, **D.O.B**, **Height**, **Weight**, **BP**, **Race**, **Pacemaker**, **Medication**, **Room No.**, **Department**, **Physician**, **Technician**, or **Ref-Physician** is selected, the item will be displayed in the **Patient Information** window.

11.4.2 Selecting ID Mode

Press **Tab** or Shift + **Tab** to move the cursor to **ID Mode** in the Patient Information Setup window, and then press the Up or Down arrow to select a mode.

You can set **ID Mode** to **Auto**, **Time** or **Manual**.

When **ID Mode** is set to **Auto,** the patient ID can be automatically generated. The patient ID range is 0~1999, 999, 999.

When **ID Mode** is set to **Time**, the patient ID can be automatically generated according to the time when you press the **START/STOP** key to print an ECG report.

When **ID Mode** is set to **Manual**, you can enter the patient ID manually in the **Patient Information** window. (Only 30 ASCII characters can be input.)

11.4.3 Selecting ID Hint

Press **Tab** or Shift + **Tab** to move the cursor to **ID Hint** in the Patient Information Setup window, and then press the Up or Down arrow to select **On** or **Off**.

In the auto, rhythm or off mode, when **ID Mode** is set to **Manual** and **ID Hint** is set to **On**, if you do not input the patient ID before pressing the **START/STOP** key, a hint will pop up to remind you to input the patient ID.

11.4.4 Setting Prompt

Press **Tab** or Shift + **Tab** to move the cursor to **Prompt** in the Patient Information Setup window, and then press the Up or Down arrow to select **Confirmed By** or **Unconfirmed**.

When **Prompt** is set to **Confirmed By,** if **Physician** is selected and the physician name is input in the **Patient Information** window, the physician's name is printed in the ECG reports.
When **Prompt** is set to **Unconfirmed**, **Unconfirmed Report** is printed in the ECG reports.

11.4.5 Selecting H/W Unit

Press **Tab** or Shift + **Tab** to move the cursor to **H/W Unit** in the Patient Information Setup window, and then press the Up or Down arrow to select **cm/kg** or **inch/lb.**.

11.4.6 Selecting BP Unit

Press **Tab** or Shift + **Tab** to move the cursor to **BP Unit** in the Patient Information Setup window, and then press the Up or Down arrow to select **mmHg** or **kpa**.

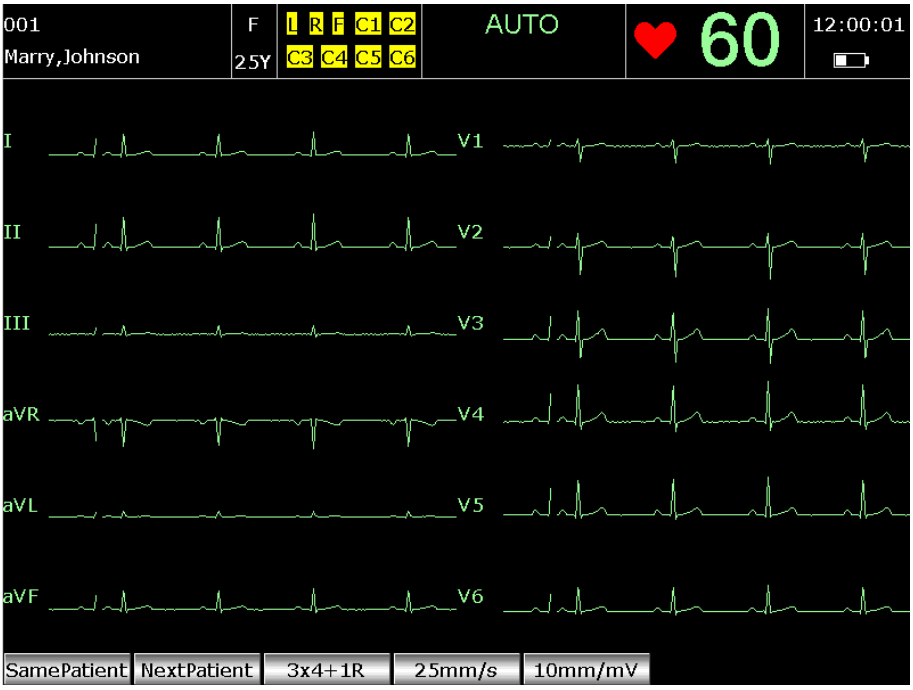
When **BP Unit** is set to **kpa**, two extra edit boxes will be displayed in the **Patient Information** window for inputting decimal fraction.

11.4.7 Selecting Next Patient

Press **Tab** or Shift + **Tab** to move the cursor to **Next Patient** in the Patient Information Setup window. Press the Up or Down arrow to highlight **Off** or **On**.

When **Next Patient** is set to **On**, in the auto mode, press the **START/STOP** key to print an ECG report, and the system will automatically open the next patient screen after a complete ECG report is printed.

On the next patient screen, pressing the function key **F1** below **Same Patient** can return to the main screen, all the patient information will keep the same; pressing the function key **F2** below **Next Patient** can return to the main screen, all the patient information will be changed except gender; pressing **F3** can switch the auto recording style; pressing **F4** can switch the paper speed, and pressing **F5** can switch the gain. Press the **START/STOP** key to print the previous ECG report again, according to the settings of the auto style, speed and gain which are shown on the bottom of the screen.



When **Next Patient** is set to **Off**, in the auto mode, the system will not automatically display the next patient screen after a complete ECG report is printed.

11.4.8 Setting the Time to Clear Patient Information

Press **Tab** or Shift + **Tab** to move the cursor to **Patient Info Cleared** in the Patient Information Setup window. Press the Up or Down arrow to highlight an option.

If **Patient Info Cleared** is set to **After Recording**, the patient information will be cleared after the ECG report is printed out.

If **Patient Info Cleared** is set to **After Recording And Lead Off**, the patient information will be cleared after the ECG report is printed out and all the leads are off.

NOTE: This function is unavailable in the manual mode.

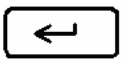
11.4.9 Inputting Customized Information

Press **Tab** or Shift + **Tab** to move the cursor to the **User Defined** textbox in the Patient Information Setup window, and then manually input customized information such as **Address**, which will be displayed in the **Patient Information** window.

11.5 Transmission Setup

NOTE:

1. To transmit ECG data in DAT format to the PC, the Smart ECG Viewer software of the manufacturer must be installed in the PC. You should log into the Smart ECG Viewer software before transmission.
2. To transmit ECG data in SCP/FDA-XML/PDF format to the PC, the FTP receiving software must be installed in the PC. You should log into the FTP receiving software before transmission.

Press **Tab** or Shift + **Tab**, or the Up, Down, Left or Right arrow to move the cursor. When the cursor is on **Transmission** on the **System Setup screen**, press  to open the **Transmission Setup window**.

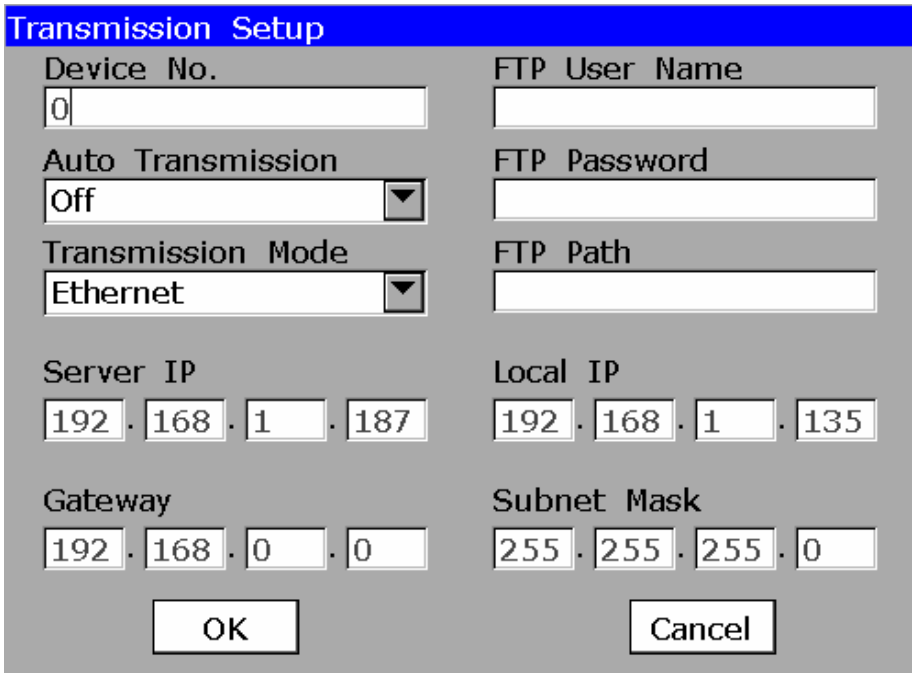


Figure 11-7 Transmission Setup window

After setup, press ↵ to confirm, or press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press ↵ to confirm. Then the **System Setup screen** appears.

11.5.1 Setting Device No.

Press **Tab** or Shift + **Tab** to move the cursor to the **Device No.** textbox, and then fill in the textbox.

If you input **1** in the **Device No.** textbox, after you save data to the U disk, the data will be in the directory of ECGDATA\ECG-01\Store\Examination Date of the U disk; after you export files from the electrocardiograph to the U disk, the files will be in the directory of ECGDATA\ECG-01\Export\Examination Date and Time of the U disk; after you import files from the U disk to the electrocardiograph, the files in the directory of ECGDATA\ECG-01\Import of the U disk will be imported.

11.5.2 Selecting Auto Transmission

Press **Tab** or Shift + **Tab** to move the cursor to **Auto Transmission**, and then press the Up or Down arrow to select **On** or **Off**.

When **Auto Transmission** is set to **On**, in the auto or rhythm mode, ECG data will be transmitted automatically after an ECG report is printed out; in the off mode, ECG data will be transmitted automatically after the **START/STOP** key is pressed.

11.5.3 Selecting Transmission Mode

Press **Tab** or Shift + **Tab** to move the cursor to **Transmission Mode**, and then press the Up or Down arrow to highlight **Ethernet** or **UART**.

When **Transmission Mode** is set to **Ethernet**, first connect the net port of the electrocardiograph to the net port of the PC by using an Ethernet cable recommended by the manufacturer. Then set all the items in the Transmission Setup window. In the auto, rhythm or off mode, ECG data can be transmitted through the net cable automatically.

When **Transmission Mode** is set to **UART**, first connect serial port 1 of the electrocardiograph to the serial port of the PC by using a serial cable recommended by the manufacturer. In the auto, rhythm or off mode, ECG data can be transmitted through the serial cable automatically.

11.5.4 Setting FTP Information

To Enter FTP Path, FTP User Name and Password

Press **Tab** or Shift + **Tab** to move the cursor to the **FTP Path**, **FTP User Name**, and **Password** textboxes, and then fill in these textboxes.

11.5.5 Setting IP Addresses

To Set Server IP

Set the **Server IP** item to the IP of the PC.

To Set Local IP

For the cross-network transmission, set the first two sections of the **Local IP** item to the first two sections of the IP of the PC. Set the third section of the **Local IP** item to the network segment of the electrocardiograph which depends on the configuration of Router. The last section of the **Local IP** item can be set at random.

For the same network transmission, set the first three sections of the **Local IP** item to the first three sections of the IP of the PC. The last section of the **Local IP** item can be set at random, but it can't be the same as the last section of the IP of the PC.

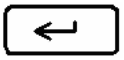
To Set Gateway

Set the first three sections of the **Gateway** item to the first three sections of the IP of the PC. The last section of the **Gateway** item must be set to **1**.

To Set Subnet Mask

You can set **Subnet Mask** in the Transmission Setup window. Commonly, **Subnet Mask** is set to **255.255.255.000**.

11.6 Lead Setup

Press **Tab** or Shift + **Tab**, or the Up, Down, Left or Right arrow to move the cursor. When the cursor is on **Lead** on the **System Setup screen**, press  to open the **Lead Setup window**.

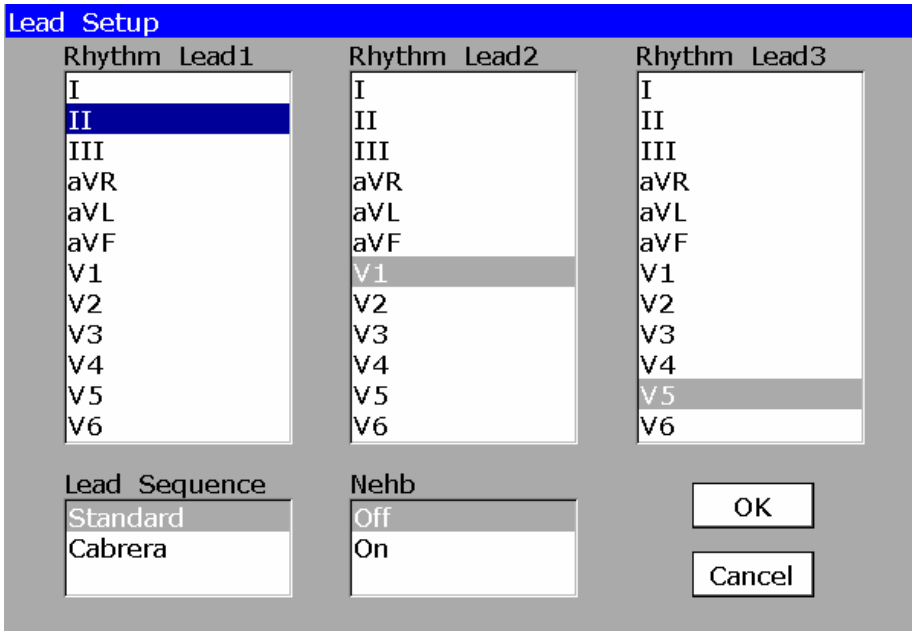


Figure 11-8 Lead Setup window

After setup, press ↵ to confirm, or press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press ↵ to confirm. Then the **System Setup screen** appears.

11.6.1 Setting Rhythm Lead1/2/3

Press **Tab** or Shift + **Tab** to move the cursor to the **Rhythm Lead1/2/3** list box in the Lead Setup window, and then press the Up or Down arrow to highlight an option.

The rhythm lead can be one of 12 standard leads: I, II, III, aVR, aVL, aVF, V1, V2, V3, V4, V5, or V6.

In the auto mode, when **Record Style** is set to **3×4+1R** or **6×2+1R**, the rhythm lead selected in the **Rhythm Lead1** list box will be printed in the ECG reports; when **Record Style** is set to **3×4+3R**, 3 rhythm leads selected respectively in the **Rhythm Lead1/2/3** list box will be printed in the ECG reports.

In the rhythm mode, when **Rhythm Style** is set to **Single Lead**, 60s wave of the rhythm lead selected in the **Rhythm Lead1** list box will be printed in the ECG reports; when **Rhythm Style** is set to **Three Leads**, 20s waves of three rhythm leads selected respectively in the **Rhythm Lead1/2/3** list box will be printed in the ECG reports.

In the R-R analysis mode, the R-R analysis report of the rhythm lead selected in the **Rhythm Lead1** list box will be printed.

11.6.2 Setting Lead Sequence

Press **Tab** or Shift + **Tab** to move the cursor to the **Lead Sequence** list box in the Lead Setup window, and then press the Up or Down arrow to highlight **Standard** or **Cabrera**.

Lead Sequence	Lead group 1	Lead group 2	Lead group 3	Lead group 4
Standard	I, II, III	aVR, aVL, aVF	V1, V2, V3	V4, V5, V6
Cabrera	aVL, I, -aVR	II, aVF, III	V1, V2, V3	V4, V5, V6

11.6.3 Selecting Nehb

Press **Tab** or Shift + **Tab** to move the cursor to the **Nehb** list box in the Lead Setup window, and then press the Up or Down arrow to highlight **Off** or **On**.

Lead Sequence: I, II, III, ND, NA, NI

NOTE: If you set **Nehb** to **On**, the working mode is fixed to be manual.

11.7 Display&Sound Setup

Press **Tab** or Shift + **Tab**, or the Up, Down, Left or Right arrow to move the cursor. When the cursor is on **Display&Sound** on the **System Setup screen**, press ↵ to open the **Display&Sound Setup window**.

After setup, press ↵ to confirm, or press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press ↵ to confirm. Then the **System Setup screen** appears.

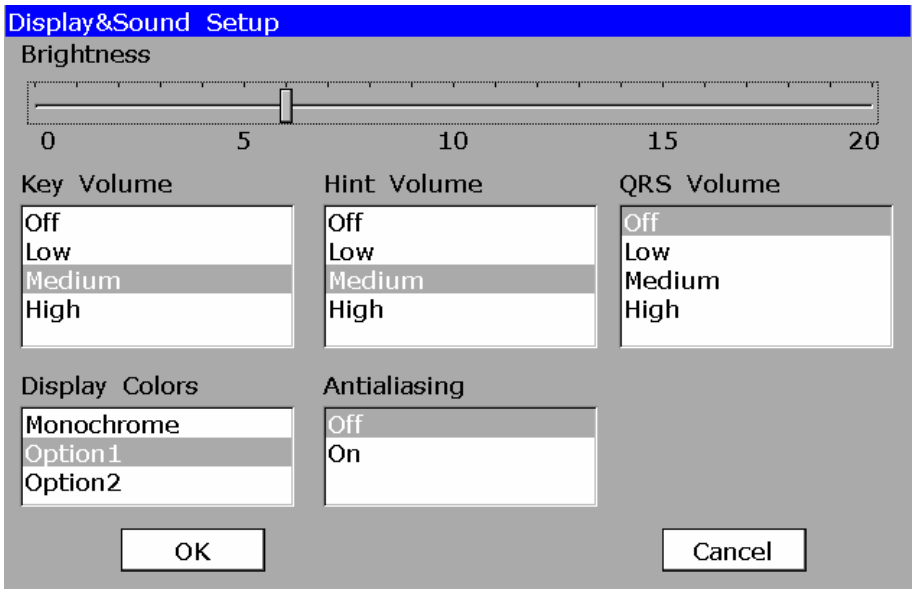


Figure 11-9 Display&Sound Setup window

11.7.1 Setting Brightness

Press **Tab** or Shift + **Tab** to move the cursor to the **Brightness** progress bar in the Display&Sound Setup window, and then press the Left or Right arrow to adjust the brightness of the LCD screen. You can set the brightness within 0~20.

11.7.2 Selecting Display Colors (Only for SE-12 Express)

Press **Tab** or Shift + **Tab** to move the cursor to the **Display Colors** list box in the Display&Sound Setup window, and then press the Up or Down arrow to highlight **Monochrome**, **Option1** or **Option2**.

11.7.3 Selecting Antialiasing

Press **Tab** or Shift + **Tab** to move the cursor to the **Antialiasing** list box in the Display&Sound Setup window, and then press the Up or Down arrow to highlight **Off** or **On**.

When **Antialiasing** is set to **On**, the system will automatically make the waveform smooth.

When **Antialiasing** is set to **Off**, the system will not make the waveform smooth.

11.7.4 Setting Key Volume

Press **Tab** or Shift + **Tab** to move the cursor to the **Key Volume** list box in the Display&Sound Setup window, and then press the Up or Down arrow to highlight an option.

When you press keys on the keyboard, the electrocardiograph gives a short sound. You can set **Key Volume** to **Low**, **Medium**, **High** or **Off**. When it is set to **Off**, there is no sound when you press keys.

11.7.5 Setting Hint Volume

Press **Tab** or Shift + **Tab** to move the cursor to the **Hint Volume** list box in the Display&Sound Setup window, and then press the Up or Down arrow to highlight an option.

When the electrocardiograph displays a hint such as *Lead Off*, *Overload*, *Battery Weak* etc., there is a sound. You can set **Hint Volume** to **Low**, **Medium**, **High** or **Off**. When it is set to **Off**, there is no hint sound.

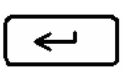
11.7.6 Setting QRS Volume

Press **Tab** or Shift + **Tab** to move the cursor to the **QRS Volume** list box in the Display&Sound Setup window, and then press the Up or Down arrow to highlight an option.

When an R wave is detected, there is a sound. You can set **QRS Volume** to **Low**, **Medium**, **High** or **Off**. When it is set to **Off**, there is no sound when an R wave is detected.

11.8 Date&Time Setup

NOTE: Please set DATE&TIME correctly when it's the first time you use the electrocardiograph.

Press **Tab** or Shift + **Tab**, or the Up, Down, Left or Right arrow to move the cursor. When the cursor is on **Date&Time** on the **System Setup screen**, press  to open the **Date&Time Setup window**.

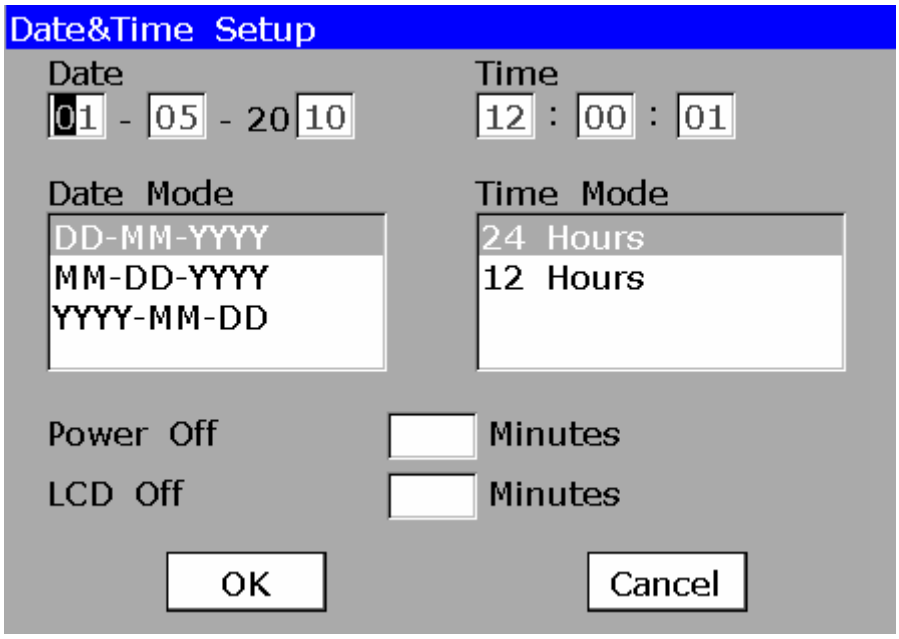


Figure 11-10 Date&Time Setup window

After setup, press ↵ to confirm, or press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press ↵ to confirm. Then the **System Setup screen** appears.

11.8.1 Setting Date and Time

Press **Tab** or Shift + **Tab** to move the cursor to the **Date** or **Time** textbox in the Date&Time Setup window, and then input the date or the time manually.

The time will be displayed on the main screen, and the date and the time will be printed in the ECG reports.

11.8.2 Setting Date Mode

Press **Tab** or Shift + **Tab** to move the cursor to the **Date Mode** list box in the Date&Time Setup window, and then press the Up or Down arrow to highlight **DD-MM-YYYY**, **MM-DD-YYYY** or **YYYY-MM-DD**.

NOTE: After setup, press ↵ to confirm, or press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press ↵ to confirm. Then the new setup will become effective.

11.8.3 Setting Time Mode

Press **Tab** or Shift + **Tab** to move the cursor to the **Time Mode** list box, and then press the Up or Down arrow to highlight **24 Hours** or **12 Hours**.

11.8.4 Setting Power-Off Time

Press **Tab** or Shift + **Tab** to move the cursor to the **Power Off** textbox in the Date&Time Setup window, and then input the power-off time manually.

When **Power Off** is not set or is set to **0 Minutes**, this function will not be effective.

NOTE:

1. Power-off time is counted from the time when you last press the keys on the keyboard.
2. Only when the device is powered by battery, can the set automatic power-off time be effective.

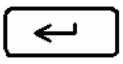
11.8.5 Setting LCD Off Time

Press **Tab** or Shift + **Tab** to move the cursor to the **LCD Off** textbox in the Date&Time Setup window, and then input the LCD off time manually.

When **LCD Off** is not set or is set to **0 Minutes**, this function will not be effective.

NOTE: LCD Off time is counted from the time when you last press the keys on the keyboard.

11.9 File Setup

Press **Tab** or Shift + **Tab**, or the Up, Down, Left or Right arrow to move the cursor. When the cursor is on **File** on the **System Setup screen**, press  to open the **File Setup window**.

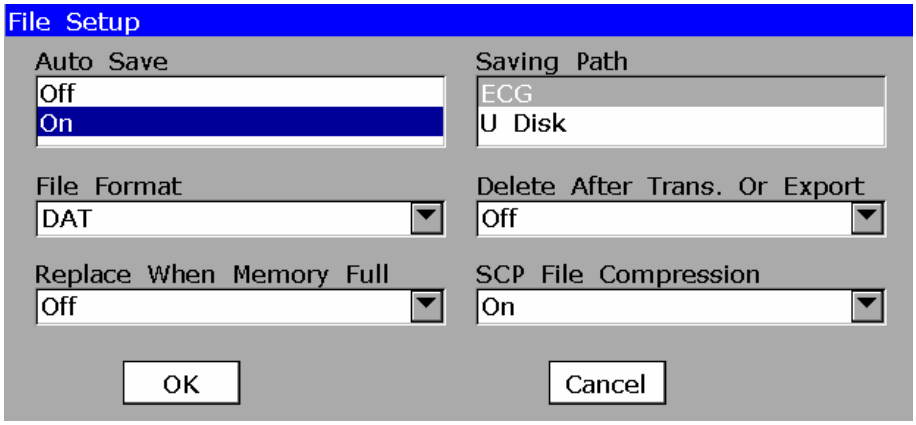


Figure 11-11 File Setup window

After setup, press ↵ to confirm, or press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press ↵ to confirm. Then the **System Setup screen** appears.

11.9.1 Selecting Auto Save

Press **Tab** or Shift + **Tab** to move the cursor to the **Auto Save** list box in the File Setup window, and then press the Up or Down arrow to highlight **Off** or **On**.

When **Auto Save** is set to **On**, ECG data in the auto, rhythm or off mode will be saved in the ECG or the U disk automatically.

When **Auto Save** is set to **Off**, ECG data will not be saved.

11.9.2 Setting Saving Path

Press **Tab** or Shift + **Tab** to move the cursor to the **Saving Path** list box in the File Setup window, and then press the Up or Down arrow to highlight **ECG** or **U Disk**.

When **Saving Path** is set to **ECG**, if **Auto Save** is set to **On**, ECG data in the auto, rhythm or off mode will be saved in the ECG automatically.

When **Saving Path** is set to **U Disk**, if **Auto Save** is set to **On**, ECG data in the auto, rhythm or off mode will be saved in the U disk automatically.

11.9.3 Setting File Format

Press **Tab** or Shift + **Tab** to move the cursor to **File Format** in the File Setup window, and then press the Up or Down arrow to highlight an option.

If you want to set **File Format** to **SCP/FDA-XML/PDF**, first activate the SCP/FDA-XML/PDF function on the **Advanced Setup screen** For details on activating the SCP/FDA-XML/PDF function, please refer to Section 9.1.3, “Transmitting ECG Data in SCP/FDA-XML/PDF Format Through Net Cable”.

11.9.4 Selecting Deleting Files After Transmission or Export

Press **Tab** or Shift + **Tab** to move the cursor to **Delete After Trans. Or Export** in the File Setup window, and then press the Up or Down arrow to highlight **Off** or **On**.

When **Delete After Trans. Or Export** is set to **On**, the files will be automatically deleted from the **File Manager screen** after they are transmitted to the PC or exported to the U disk.

11.9.5 Selecting Replacing When Memory is Full

Press **Tab** or Shift + **Tab** to move the cursor to **Replace When Memory Full** in the File Setup window, and then press the Up or Down arrow to highlight **Off** or **On**.

When **Replace When Memory Full** is set to **On**, if there is no space on the memory, the files will replace the earliest ones automatically.

11.9.6 Selecting SCP File Compression

Press **Tab** or Shift + **Tab** to move the cursor to **SCP File Compression** in the File Setup window, and then press the Up or Down arrow to highlight **On** or **Off**.

If **SCP File Compression** is set to **On**, the SCP file will be compressed.

After the SCP function is activated, **SCP File Compression** appears in the File Setup window. For details on activating the SCP function, please refer to Section 9.1.3, “Transmitting ECG Data in SCP/FDA-XML/PDF Format Through Net Cable”.

11.10 System Maintenance Setup

Press **Tab** or Shift + **Tab**, or the Up, Down, Left or Right arrow to move the cursor. When the cursor is on **Maintenance** on the **System Setup screen**, press ↵ to open the **System Maintenance window**.

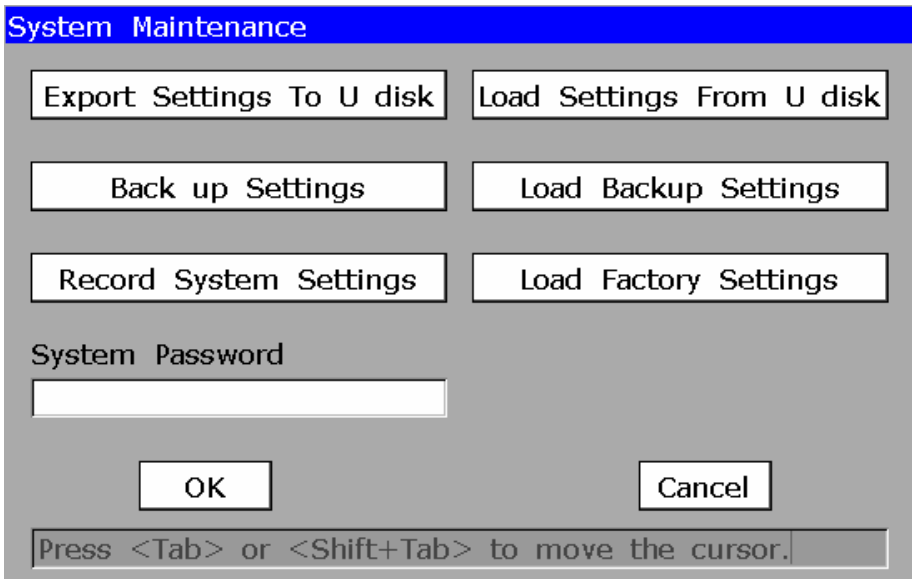


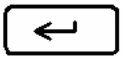
Figure 11-12 System Maintenance window

After setup, press ↵ to confirm, or press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press ↵ to confirm. Then the **System Setup screen** appears.

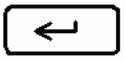
11.10.1 Exporting System Settings to U Disk

1. Connect a U disk to the electrocardiograph.
2. Press **Tab** or Shift + **Tab** to move the cursor to the **Export Settings To U disk** button in the System Maintenance window, and then press ↵ to export the system settings to the U disk.

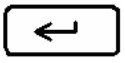
11.10.2 Loading System Settings from U Disk

1. Connect the U disk containing the system settings to the electrocardiograph.
2. Press **Tab** or Shift + **Tab** to move the cursor to the **Load Settings From U disk** button in the System Maintenance window, and then press  to load the system settings from the U disk to the electrocardiograph.

11.10.3 Backing Up Settings

Press **Tab** or Shift + **Tab** to move the cursor to the **Back up Settings** button in the System Maintenance window, and then press  to back up the system settings to the ECG.

11.10.4 Loading Backup Settings

Press **Tab** or Shift + **Tab** to move the cursor to the **Load Backup Settings** button in the System Maintenance window, and then press  to load the backup settings from the ECG.

11.10.5 Printing System Settings

Press **Tab** or Shift + **Tab** to move the cursor to the **Record System Settings** button in the System Maintenance window, and then press to print the system settings. Pressing this button again can stop printing system settings.

11.10.6 Loading Factory Settings

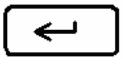
Press **Tab** or Shift + **Tab** to move the cursor to the **Load Factory Settings** button in the System Maintenance window, and then press  to restore the factory settings shown in the following table.

Table 11-1 System Setup Defaults

Resting ECG		
	Setup	**Default**
1	Mode Options	Auto, Manual, Rhythm
2	Manual Style	6 channels
3	Auto Display Style	6×2
4	Rhythm Style	Three Leads
5	Sampling Mode	Real-time Sample
6	Duration (Periodic Sample)	60 min
7	Interval (Periodic Sample)	1 min
8	Preview	Off
9	Auto Extend Record	Off
10	AC filter	On
11	EMG filter	Off
12	DFT filter	0.67Hz
13	Lowpass filter	100Hz
14	Record Style	6×2
15	Record Mode	Save Paper
16	Record Sequence	Sequential
17	Gain	10mm/mV
18	Record Device	Thermal
19	Speed	25mm/s
20	Paper Marker	Yes
21	Sample Time	10s
22	Patient Information	On
23	Template	On
24	Position Marker	On
25	Measure	On
26	Analysis	On

27	Minnesota Code	Off
28	Baseline Adjustment	Horizontal
29	R-R Histogram	On
30	R-R Interval List	On
31	R-R Waveform	On
32	Grid of Thermal Report	Off
33	Grid of USB Report	On
34	Gender\Height\Weight	On
35	First/Last Name \ D.O.B \ BP \ Race \ Pacemaker \ Medication \ Room No. \ Department \ Physician \ Technician \ Ref-Physician	Off
36	ID Hint	On
37	Next Patient	Off
38	ID Mode	Auto
39	Patient Information Cleared	After Recording
40	H/W Unit	cm/kg
41	BP Unit	mmHg
42	Prompt	Confirmed By
43	User Defined	Cleared
44	Auto Transmission	Off
45	Transmission Mode	Ethernet
46	FTP User Name/FTP Password/FTP Path	Cleared
47	Lead Sequence	Standard
48	Nehb	Off
49	Rhythm Lead 1	II
50	Rhythm Lead 2	V1
51	Rhythm Lead 3	V5
52	Screen Colors(Only for SE-12 Express)	Option 1

53	Antialiasing	Off
54	QRS Volume	Off
55	Hint Volume	Medium
56	Key Volume	Medium
57	Date Mode	DD-MM-YYYY
58	Time Mode	24 Hours
59	Power Off	0
60	LCD Off	0
61	Auto Save	On
62	Saving Path	ECG
63	File Format	DAT
64	Delete After Trans. Or Export	Off
65	Replace When Memory Full	Off
66	SCP File Compression	On
67	System Password	Cleared
68	Caps Lock	Off
69	Pacemaker Detection Sensitivity	Low
Exercise ECG		
1	Display Style	4×3
2	Speed Unit	mph
3	Post J	60ms
4	Device Type	Treadmill
5	Device Model	TM400(M)
6	Ergometer	Ergoline
7	BP Monitor	In Ergometer
8	Maximum Systole	220mmHg
9	Maximum Diastole	90 mmHg
10	Minimum Systole	110 mmHg
11	Minimum Diastole	60 mmHg

12	Max Predicted HR	220
13	The proportion of Target HR in Max Predicted HR	85
14	AC Filter	On
15	DFT Filter	0.67Hz
16	EMG Filter	Off
17	Lowpass Filter	100Hz
18	Rhythm Lead 1	II
19	Rhythm Lead 2	V1
20	Rhythm Lead 3	V5
21	Lead Sequence	Standard
22	Gain	10mm/mV
23	Paper Marker	Yes
24	Exercise Report	Late Stage
25	Report Style	6×2+1
26	Recovery Report	On
27	Start time of Recovery Report	10s
28	Interval of Recovery Report	2min
29	Summary Report	On
30	ST Scope Report	On
31	Trend Graph Report	On
32	Edit Conclusion	On

Table 11-2 System Setup Defaults (only in the U.S.)

Resting ECG		
	Setup	**Default**
1	Mode Options	Auto, Manual, Rhythm, OFF, R-R
2	Manual Style	6 channels
3	Auto Display Style	3×4+1
4	Rhythm Style	Three Leads

5	Sampling Mode	Real-time Sample
6	Duration (Periodic Sample)	60 min
7	Interval (Periodic Sample)	1 min
8	Preview	Off
9	Auto Extend Record	Off
10	AC filter	On
11	EMG filter	Off
12	DFT filter	0.67Hz
13	Lowpass filter	100Hz
14	Record Style	3×4+1
15	Record Mode	Save Paper
16	Record Sequence	Sequential
17	Gain	10mm/mV
18	Record Device	Thermal
19	Speed	25mm/s
20	Paper Marker	Yes
21	Sample Time	10s
22	Patient Information	On
23	Template	On
24	Position Marker	On
25	Measure	On
26	Analysis	On
27	Minnesota Code	Off
28	Baseline Adjustment	Horizontal
29	R-R Histogram	On
30	R-R Interval List	On
31	R-R Waveform	On
32	Grid of Thermal Report	Off
33	Grid of USB Report	On

34	Gender\Height\Weight\D.O.B	On
35	First/Last Name \ BP \ Race \ Pacemaker \ Medication \ Room No. \ Department \ Physician \ Technician \ Ref-Physician	Off
36	ID Hint	On
37	Next Patient	Off
38	ID Mode	Manual
39	Patient Information Cleared	After Recording
40	H/W Unit	inch/lb
41	BP Unit	mmHg
42	Prompt	Confirmed By
43	User Defined	Cleared
44	Auto Transmission	Off
45	Transmission Mode	Ethernet
46	FTP User Name/FTP Password/FTP Path	Cleared
47	Lead Sequence	Standard
48	Nehb	Off
49	Rhythm Lead 1	II
50	Rhythm Lead 2	V1
51	Rhythm Lead 3	V5
52	Screen Colors(Only for SE-12 Express)	Option 1
53	Antialiasing	Off
54	QRS Volume	Off
55	Hint Volume	Medium
56	Key Volume	Medium
57	Date Mode	DD-MM-YYYY
58	Time Mode	24 Hours
59	Power Off	0

60	LCD Off	0
61	Auto Save	On
62	Saving Path	ECG
63	File Format	PDF
64	Delete After Trans. Or Export	Off
65	Replace When Memory Full	Off
66	SCP File Compression	On
67	System Password	Cleared
68	Caps Lock	Off
69	Pacemaker Detection Sensitivity	Low
Exercise ECG		
1	Display Style	6×2
2	Speed Unit	mph
3	Post J	60ms
4	Device Type	Treadmill
5	Device Model	TMX425
6	Ergometer	Ergoline
7	BP Monitor	In Ergometer
8	Maximum Systole	220mmHg
9	Maximum Diastole	90 mmHg
10	Minimum Systole	110 mmHg
11	Minimum Diastole	60 mmHg
12	Max Predicted HR	220
13	The proportion of Target HR in Max Predicted HR	85
14	AC Filter	On
15	DFT Filter	0.67Hz
16	EMG Filter	Off
17	Lowpass Filter	100Hz

18	Rhythm Lead 1	II
19	Rhythm Lead 2	V1
20	Rhythm Lead 3	V5
21	Lead Sequence	Standard
22	Gain	10mm/mV
23	Paper Marker	Yes
24	Exercise Report	Late Stage
25	Report Style	3×4+1
26	Recovery Report	On
27	Start time of Recovery Report	10s
28	Interval of Recovery Report	2min
29	Summary Report	On
30	ST Scope Report	On
31	Trend Graph Report	On
32	Edit Conclusion	On

11.10.7 Setting System Password

Press **Tab** or Shift + **Tab** to move the cursor to the **System Password** textbox in the System Maintenance window, and then enter the password.

If you set the system password, after you press the function key **F6** below **Setup**, the **System Password** window will pop up. After you enter the correct password, the **System Setup screen** will be displayed.

11.11 Other Setup

Press **Tab** or Shift + **Tab**, or the Up, Down, Left or Right arrow to move the cursor. When the cursor is on **Other** on the **System Setup screen**, press ↵ to open the **Other Setup window**.

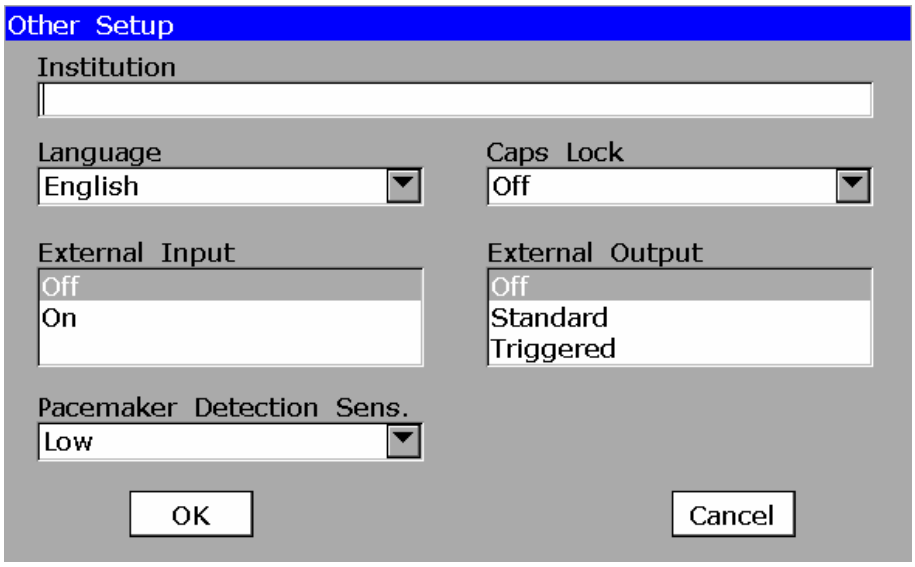


Figure 11-13 Other Setup Window

After setup, press ↵ to confirm, or press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press ↵ to confirm. Then the **System Setup screen** appears.

11.11.1 Entering Institution

Press **Tab** or Shift + **Tab** to move the cursor to the **Institution** textbox on the **Other Setup Window**, and then manually input the institution name within 40 ASCII characters.

NOTE: The total number of supported characters may be fewer if either special Latin characters or Chinese characters are entered.

11.11.2 Selecting a Language

Press **Tab** or Shift + **Tab** to move the cursor to **Language** on the **Other Setup Window**, and then press the Up or Down arrow to highlight a language.

11.11.3 Selecting Caps Lock

Press **Tab** or Shift + **Tab** to move the cursor to **Caps Lock** on the **Other Setup Window**, and then press the Up or Down arrow to highlight **Off** or **On**.

When **Caps Lock** is set to **On**, the letters entered will be capital. Pressing Shift and a letter key can input a lowercase letter.

When **Caps Lock** is set to **Off**, the letters entered will be lowercase. Pressing Shift and a letter key can input a capital letter.

11.11.4 Setting External Input

Press **Tab** or Shift + **Tab** to move the cursor to the **External Input** list box on the **Other Setup Window**, and then press the Up or Down arrow to highlight **Off** or **On**.

The extern input socket is equipped in the electrocardiograph, through which the electrocardiograph can receive signals from the external equipment.

NOTE: When **External Input** is set to **On**, the touch screen becomes ineffective, and then you should operate the device by using the keyboard.

11.11.5 Setting External Output

Press **Tab** or Shift + **Tab** to move the cursor to the **External Output** list box on the **Other Setup Window**, and then press the Up or Down arrow to highlight an option.

The extern output socket is equipped in the electrocardiograph, through which the electrocardiograph can send signals to the external equipment.

If **External Input** is set to **On**, and **External Output** is set to **Standard** or **Triggered**, the electrocardiograph sends the signals which it receives.

If **External Input** is set to **Off**, and **External Output** is set to **Standard**, the electrocardiograph sends ECG signals of rhythm lead I.

If **External Input** is set to **Off**, and **External Output** is set to **Triggered**, the electrocardiograph sends pulses with the height of 4V and the width of 40ms, based on the data of rhythm lead I.

11.11.6 Setting Pacemaker Detection Sensitivity

Press **Tab** or Shift + **Tab** to move the cursor to **Pacemaker Detection Sens.** on the **Other Setup Window**, and then press the Up or Down arrow to highlight **Low** or **High**.

When **Pacemaker Detection Sens.** is set to **High**, the pacemaker signals are easy to be detected.

When **Pacemaker Detection Sens.** is set to **Low**, the pacemaker signals are not easy to be detected.

For more information about the detectable parameter ranges, please refer to Appendix 1, "Technical Specifications".

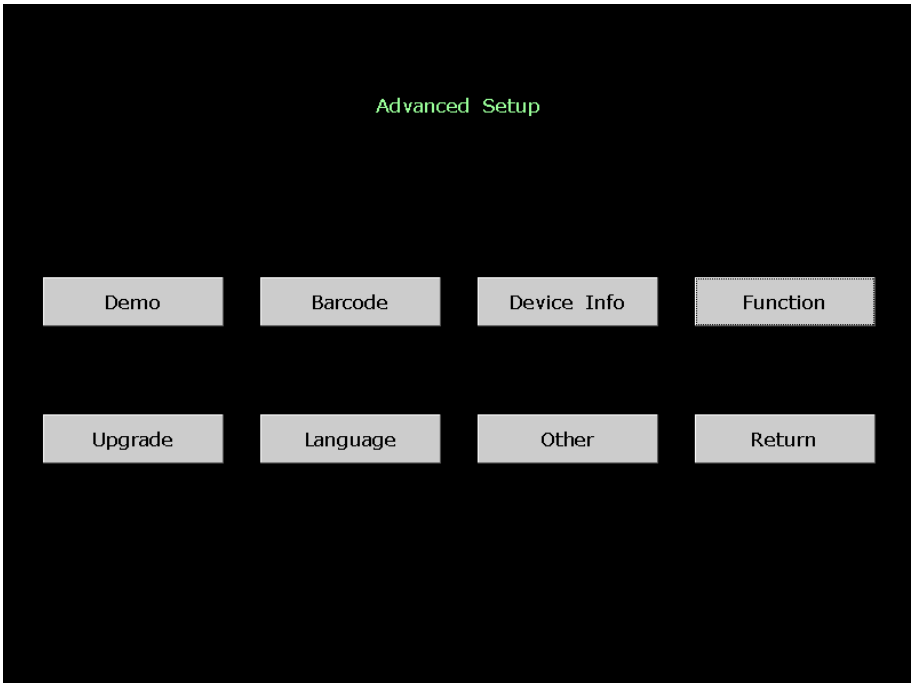
NOTE: If you select **Pacemaker** in the Patient Information Setup window, the pacemaker sensitivity can only be set in the **Patient Information** window, and the setting of **Pacemaker Detection Sens.** on the **Other Setup Window** is ineffective.

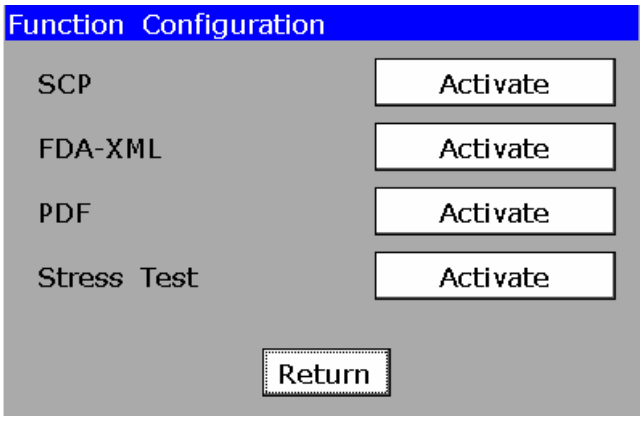
Chapter 12 Operation Instructions for Exercise ECG (Configurable for SE-12 Express)

12.1 Activating Exercise ECG Function

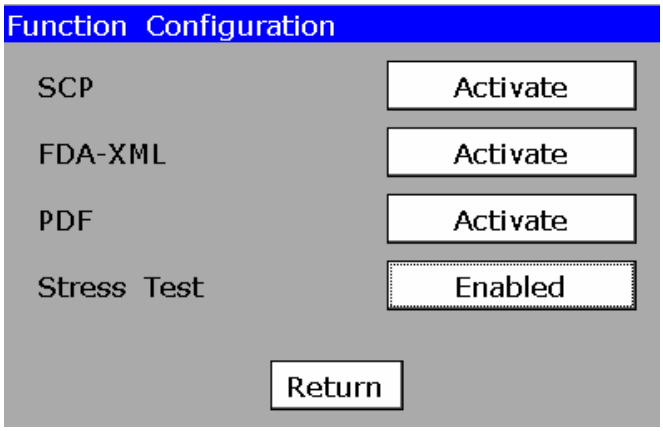
1. When the main screen is displayed, press the function key **F6** below **Setup** to open the **System Setup screen**.

2. Press **F1** to display the **Service Password** window. Then enter the password and press ↵ to open the **Advanced Setup screen** Press **Tab** or Shift + **Tab**, or the Up, Down, Left or Right arrow to move the cursor to **Function**, and then press ↵ to open the **Function Configuration** window.





3. Press **Tab** or Shift + **Tab** to move the cursor to the **Activate** button after **Stress Test**. Press ↵ to open the **Activate Password** window. Enter the password and press ↵ to activate the exercise ECG function.



NOTE: Please contact local distributors to get the service password and the activating password.

12.2 Operation Preparation

1. Turn on the electrocardiograph

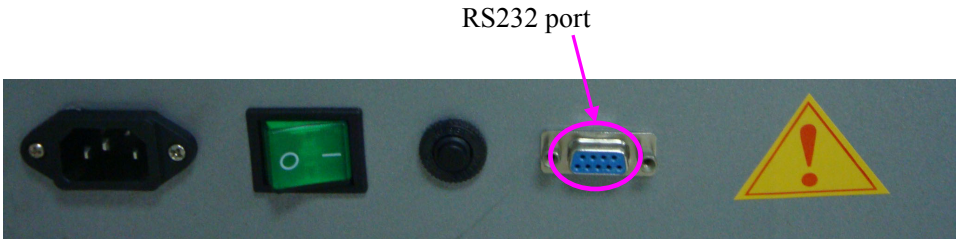
NOTE: Turn on the electrocardiograph before connecting the treadmill or the ergometer; or else, the start-up of the electrocardiograph may be abnormal.

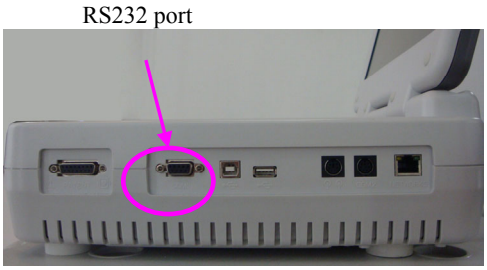
2. Connect the electrocardiograph to the treadmill or the ergometer.

CAUTION

Only the treadmill/ergometer recommended by the manufacturer can be connected to Serial Port 1 and Serial Port 2.

1) Connect the electrocardiograph to the treadmill

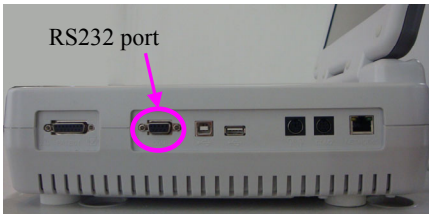




Connect the RS232 port of the treadmill to the RS232 port of the electrocardiograph with an RS232 cable.

NOTE: The position of the RS232 port may be different on different treadmills.

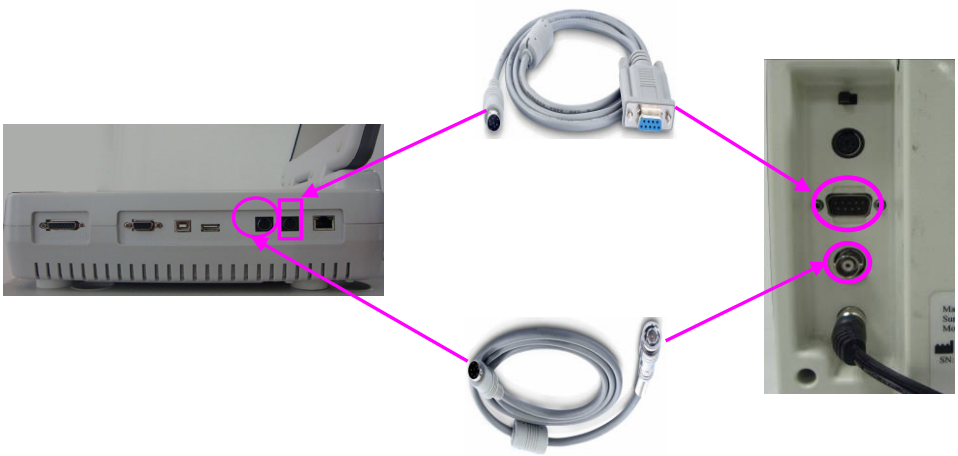
2) Connect the electrocardiograph to the ergometer



Connect the RS232 in port of the ergometer to the RS232 port of the electrocardiograph with an RS232 cable.

NOTE: The position of the RS232 in port may be different on different ergometers.

3. Connect the electrocardiograph to the stress BP monitor



4. Connect the power cords, and connect the earth wire (when necessary)

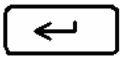
5. Load the recorder paper

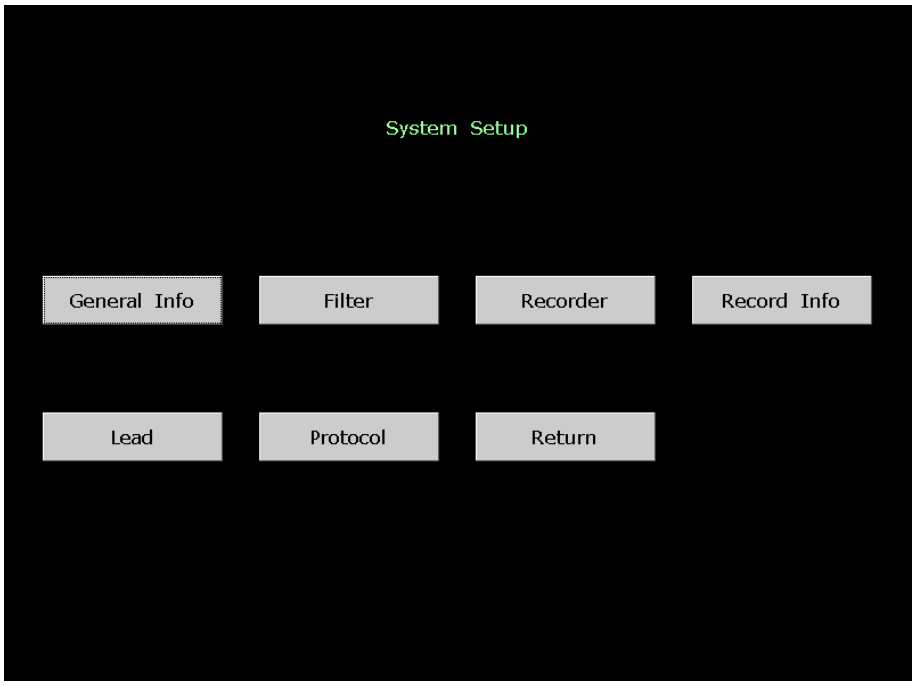
6. Turn on the stress BP monitor and treadmill/ergometer

7. Set the electrocardiograph

   1) After turning on the electrocardiograph, press **Pretest** on the keyboard to open the main screen of the exercise test.

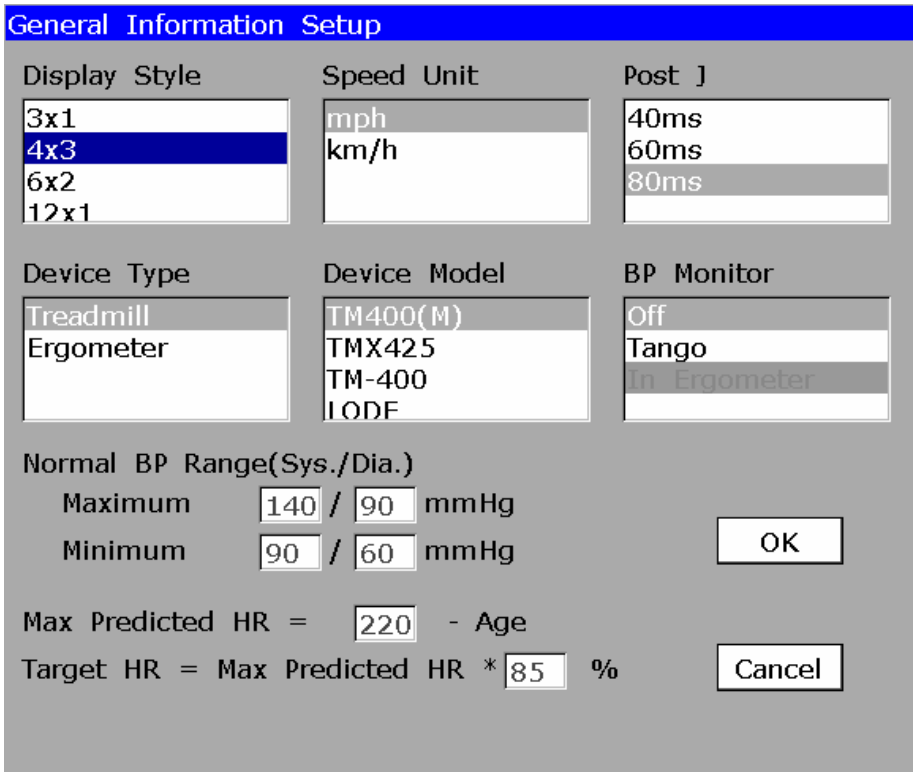
   2) Press the function key **F6** below **Setup** to open the **System Setup screen**.

   3) Press **Tab** or Shift + **Tab**, or the Up, Down, Left or Right arrow to move the cursor. When the cursor is on **General Info** on the **System Setup screen**, press  to open the **General Information Setup window**.



   4) Set **Device Type**, **Device Mode**, and **BP Monitor**

Press **Tab** or Shift + **Tab** to move the cursor to the **Device Type** list box, and then press the Up or Down arrow to highlight **Treadmill** or **Ergometer**. Press **Tab** or Shift + **Tab** to move the cursor to the **Device Model** list box, and then press the Up or Down arrow to specify the device model. Press **Tab** or Shift + **Tab** to move the cursor to the **BP Monitor** list box, and then press the Up or Down arrow to highlight **Off**, **Tango** or **In Ergometer**.



5) Press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press ↵ to confirm. Then the **System Setup screen** appears.

6) Press **Tab** or Shift + **Tab**, or the Up, Down, Left or Right arrow to move the cursor. When the cursor is on **Protocol** on the **System Setup screen**, press ↵ to open the **Protocol Manager** screen. Select a protocol by pressing the Up or Down arrow. Then press the function key **F7** below **Return** to return to the **System Setup screen**.

7) Press **Tab** or Shift + **Tab**, or the Up, Down, Left or Right arrow to move the cursor to **Return**, and then press to return to the main screen of the exercise test.

8. Setting the treadmill or the ergometer for external control

1) For TM-400 treadmill, it is ready for external control and needn't be set.

2) For Lode Treadmill Valiant

Hold down the following two keys for 10 seconds, and then you will enter the service menu of the Valiant.

By default, the Valiant is shipped with the Lode RS232 communication protocol. It should be set to the Trackmaster RS232 protocol. You can change the communication protocol by following the procedures below:

- Select **Prot id** and select the second RS232 protocol which is the Trackmaster communication protocol
- Select **Baudrate** and set this to **4800 Baud**
- Press the red button to leave the service menu
- Turn off the Valiant

3) For Lode ergometer

- Turn on the ergometer

By default, the Corival ergometer is shipped with the LODE RS232 communication protocol. It should be set to the ERGOLINE P4 protocol.

You can change the RS232 protocol by following the procedures below:

- Turn on the ergometer and press **Enter**
- You will be in **MAINMENU**
- Select, by using the Up/Down keys, the menu **SYSTEM PARAMETER** and press **Enter**
- Select, by using the Up/Down keys, the menu **SETTINGS** and press **Enter**
- Select, by using the Up/Down keys, the menu **RS232 PROTOCOL** and press **Enter**
- Select, by using the Up/Down keys, **ERGOLINE P4** and press **Enter**
- Save the selected RS232 protocol or restore the default RS232 protocol, which is also the LODE PROTOCOL.
- Turn off the ergometer

- For controlling the ergometer by SE-12 Express, the ergometer should be set in the **ANALOG** mode. The **ANALOG** mode should be selected as follows. After turning on the ergometer, press Enter, select **ANALOG** and press Enter again.

NOTE: You can also let the ergometer start up in the **ANALOG** mode every time you turn on the ergometer, by using the default start menu.

To set the ergometer for starting up in the **ANALOG** mode, proceed as follows:

- Turn on the ergometer and press **Enter**
- You will be in **MAINMENU**
- Select, by using the Up/Down keys, the menu **SYSTEM PARAMETER** and press **Enter**
- Select, by using the Up/Down keys, the menu **SETTINGS** and press **Enter**
- Press **Enter** to confirm the menu **DEFAULTSTARTMENU** and press **Enter**

If you turn off the ergometer, it will start up in the **ANALOG** mode every time the ergometer is turned on again.

- The Lode ergometer is now ready for external control

For details on setting other models for external control, please refer to the connection instruction of the models.

9. When the main screen of the exercise test is displayed, press the function key **F1** below **Patient** to open the **Patient Information** window. Enter the patient information. For details on entering patient information, please refer to Chapter 6, "Entering Patient Information".

NOTE: If you do not enter the patient age or the birthday before pressing the **Pretest** key to begin the exercise test, a hint will pop up to remind you to input the patient age.

12.3 Exercise Test

Attach all the electrodes to the patient, Apply the stress BP monitor to the patient.

Press the **Pretest** key to begin the pretest phase. After pretest, the patient can get on the treadmill or the ergometer.

Press the **Exercise** key to enter the exercise phase, and then observe the ECG waveforms, heart rate, blood pressure and the patient's state.

When the target heart rate is reached, press the **Recovery** key to enter the recovery phase, and then observe the ECG waveforms, heart rate, blood pressure and the patient's state.

When the patient's heart rate resumes the normal value, press the **Test end** key to terminate the exercise test. Take off the patient cable and electrodes.

Press **START/STOP** to print the summary report, ST scope report and trend graph report.

Pressing **START/STOP** again can stop printing the reports.

12.4 System Setup for Exercise Test

After turning on the electrocardiograph, press **Pretest** on the keyboard to open the main screen of the exercise test. Press the function key **F6** below **Setup** to open the **System Setup screen**.

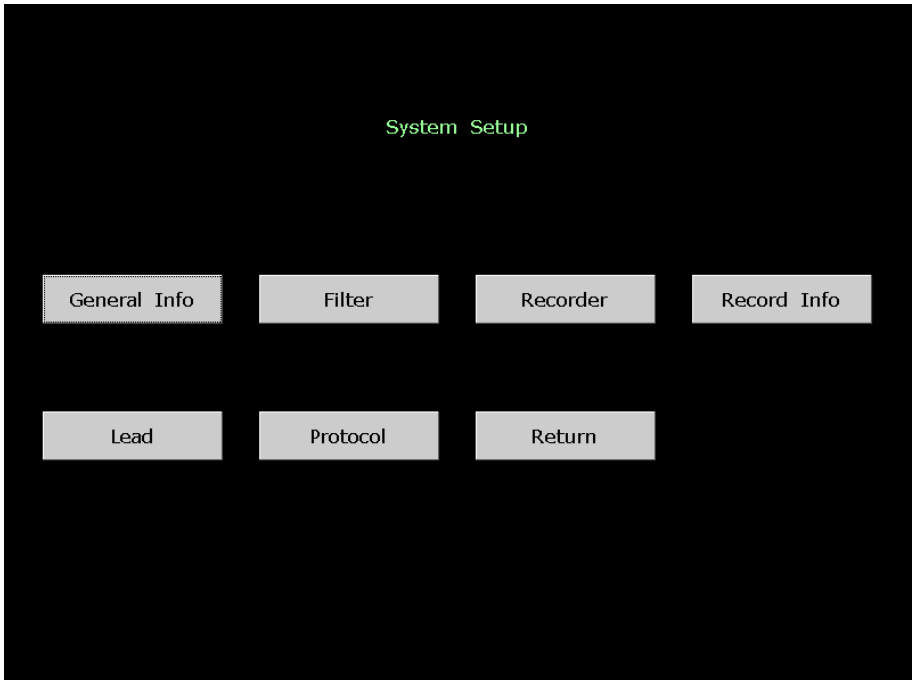


Figure 12-1 System Setup screen for Exercise Test

After setup,

1. Press **ESC** to return to the main screen of the exercise test.

2. Or press **Tab** or Shift + **Tab**, or the Up, Down, Left or Right arrow to move the cursor to **Return**, and then press ↵ to return to the main screen of the exercise test.

NOTE: The setting methods of filter, recorder and lead of the exercise ECG are the same as those of the resting ECG. For details about the setting methods, please refer to Section 11.2 “Filter Setup”, Section 11.3.1 “Setup 1”, and Section 11.6 “Lead Setup”.

12.4.1 General Information Setup

Press **Tab** or Shift + **Tab**, or the Up, Down, Left or Right arrow to move the cursor. When the cursor is on **General Info** on the **System Setup screen**, press ↵ to open the **General Information Setup window**.

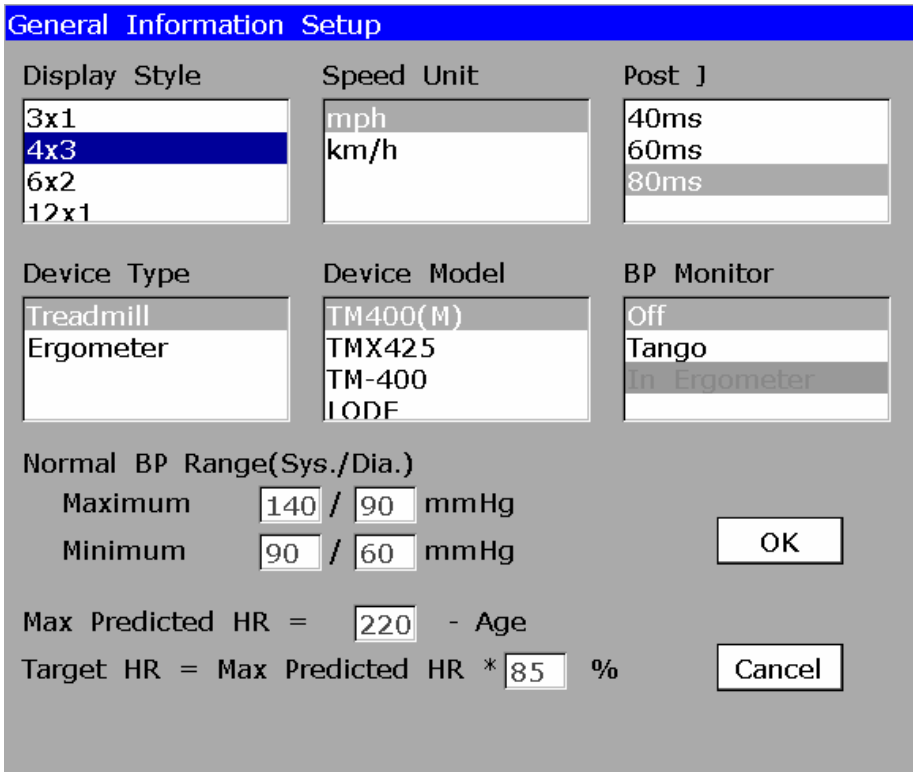


Figure 12-2 General Information Setup window

Press **Tab** or Shift + **Tab** to move the cursor to a list box, and then press the Up or Down arrow to highlight an option. Or press **Tab** or Shift + **Tab** to move the cursor to a textbox, and then fill in the textbox.

After setup, press ↵ to confirm, or press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press ↵ to confirm. Then the **System Setup screen** appears.

1. Display Style

When **Display Style** is set to **3×1**, 3-channel ECG waves are displayed on the main screen of the exercise test.

When **Display Style** is set to **4×3**, 12-channel ECG waves are displayed in 3 groups of 4 on the main screen of the exercise test.

When **Display Style** is set to **6×2**, 12-channel ECG waves are displayed in 2 groups of 6 on the main screen of the exercise test.

When **Display Style** is set to **12×1**, 12-channel ECG waves are displayed on the main screen of the exercise test.

NOTE: When the main screen of the exercise test is displayed, pressing the Up or Down arrow on the keyboard can switch the display styles. When the display style is 3×1, pressing the Left or Right arrow on the keyboard can switch the lead groups.

2. Speed Unit

You can set **Speed Unit** to **mph** or **km/h**.

3. Post J

Post J is the length after J point of ST segment. You can set **Post J** to **0ms**, **20ms**, **40ms**, **60ms** or **80ms**.

NOTE: J point is the connection point between the end of QRS complex and the start of ST segment. It is the standard point to fix the position of ST segment. Please select a proper option based on the patient's actual ECG waves.

4. Device Type/Device Model/BP Monitor

Press **Tab** or Shift + **Tab** to move the cursor to the **Device Type** list box, and then press the Up or Down arrow to highlight **Treadmill** or **Ergometer**. Press **Tab** or Shift + **Tab** to move the cursor to the **Device Model** list box, and then press the Up or Down arrow to specify the device model. Press **Tab** or Shift + **Tab** to move the cursor to the **BP Monitor** list box, and then press the Up or Down arrow to highlight **Off**, **Tango** or **In Ergometer**.

NOTE:

1. You should test whether the treadmill is controlled by SE-12 Express well when SE-12 Express is connected to the treadmill for the first time.
2. Do not stand on the treadmill when testing it for the first time.
3. Before the exercise test, be sure to be familiar with the user manual of the treadmill or the ergometer.
4. If you have any questions about the operation, please contact us or your local distributor.

5. Normal BP Range

You can set the normal range of the systolic/diastolic blood pressure. If the patient's blood pressure values exceed the normal BP ranges, the system will give a hint.

6. Max Predicted HR and Target HR

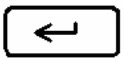
The following formulas are applied to calculate the target heart rate.

Max Predicted HR = 220 - Age

Target HR = Max Predicted HR * 85%

NOTE: **220** and **85** are default values, and you can modify them in different situations.

12.4.2 Record Information Setup

Press **Tab** or Shift + **Tab**, or the Up, Down, Left or Right arrow to move the cursor. When the cursor is on **Record Info** on the **System Setup screen**, press  to open the **Record Info Setup window**.

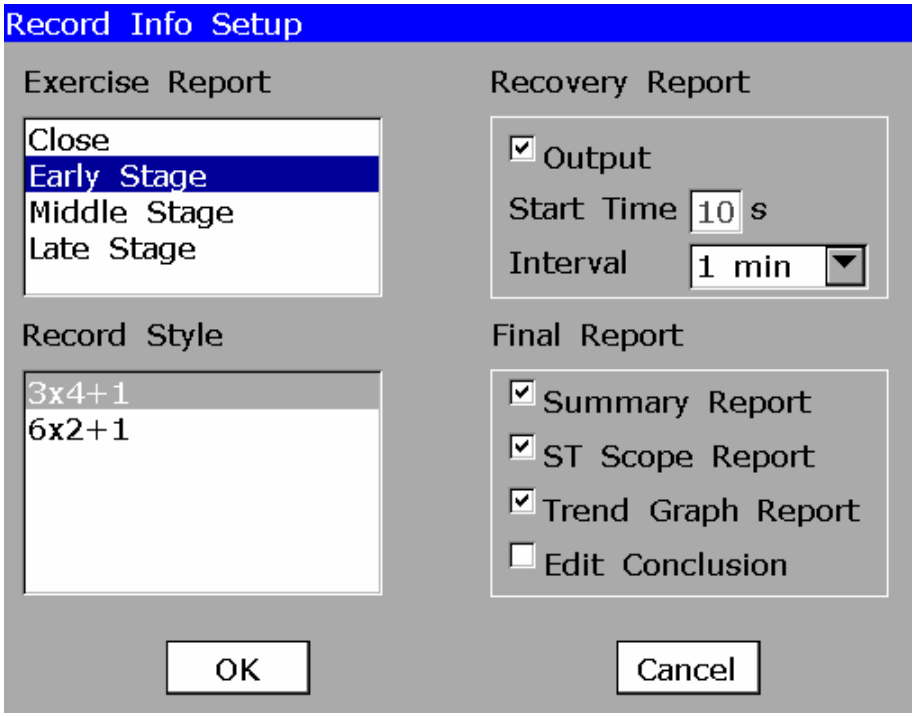
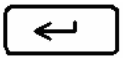
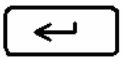


Figure 12-3 Record Info Setup window

Press **Tab** or Shift + **Tab** to move the cursor to a list box, and then press the Up or Down arrow to highlight an option. Or press **Tab** or Shift + **Tab** to move the cursor to a textbox, and then fill in the textbox. Or press **Tab** or Shift + **Tab** to move the cursor to a checkbox, and then press Spacebar to select or deselect it.

After setup, press  to confirm, or press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press  to confirm. Then the **System Setup screen** appears.

1. Exercise Report

When **Close** is highlighted, 12-lead ECG report of the exercise phase will not be printed out automatically during the exercise test.

When **Early Stage** is highlighted, 12-lead ECG report will be printed out automatically at the early period of each stage of the exercise phase.

When **Middle Stage** is highlighted, 12-lead ECG report will be printed out automatically at the middle period of each stage of the exercise phase.

When **Late Stage** is highlighted, 12-lead ECG report will be printed out automatically at the late period of each stage of the exercise phase.

2. Recovery Report

When **Output** is deselected, 12-lead ECG report of the recovery phase will not be printed out automatically during the exercise test.

When **Output** is selected, 12-lead ECG report of the recovery phase will be printed out automatically during the exercise test. You can set the start time to print the first recovery report by filling in the **Start Time** textbox. For example, if you fill **10** in the **Start Time** textbox, the first recovery report will be printed out 10s after entering the recovery phase. You can set the interval to print the later recovery reports in the **Interval** pull-down list. For example, if you select **1 min** in the **Interval** pull-down list, the later recovery reports will be printed out every 1 min.

3. Report Style

When **Report Style** is set to **3×4+1**, ECG waves of 12 leads are printed in 4 groups of 3, with the ECG wave of one rhythm lead on the bottom of the ECG reports.

When **Report Style** is set to **6×2+1**, ECG waves of 12 leads are printed in 2 groups of 6, with the ECG wave of one rhythm lead on the bottom of the ECG reports.

4. Final Report

You can select **Summary Report**, **ST Scope Report**, **Trend Graph Report** and **Edit Conclusion** as the final reports. After an exercise test is terminated, you can press the **START/STOP** key on the keyboard to print out the selected final reports.

NOTE: Pressing the **START/STOP** key during the printing course can stop printing.

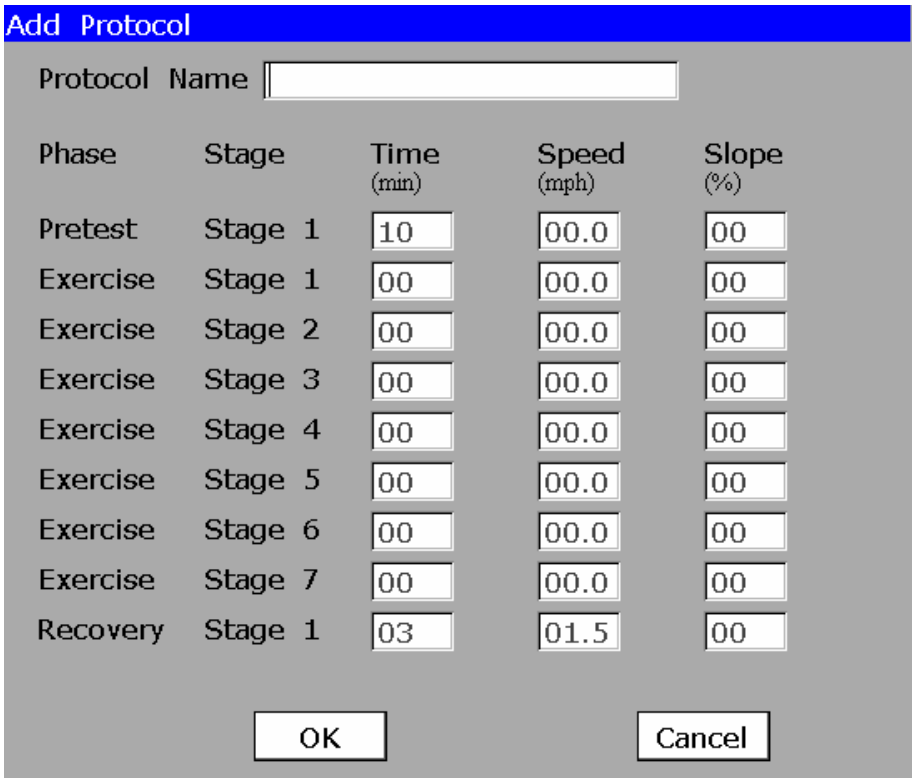
12.4.3 Protocol Manager

Press **Tab** or Shift + **Tab**, or the Up, Down, Left or Right arrow to move the cursor. When the cursor is on **Protocol** on the **System Setup screen**, press to open the **Protocol Manager** screen.

Figure 12-4 Protocol Manager Screen

1. Add

Press the function key **F1** below **Add** to display the following dialog box.

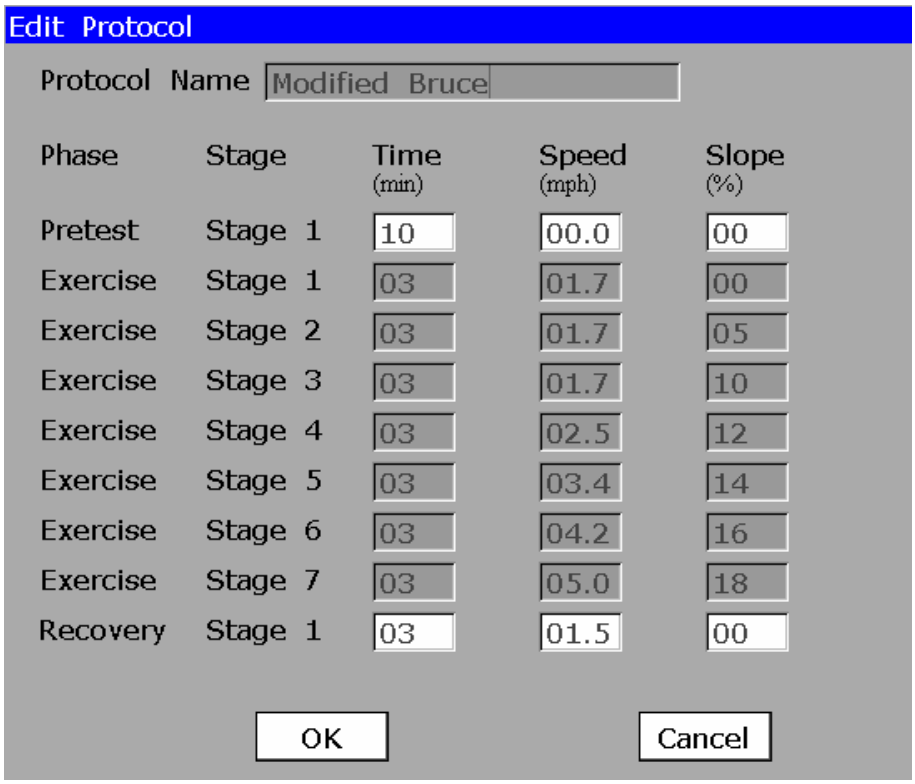


In the **Add Protocol** dialog box, firstly you should enter the new protocol name in the **Protocol Name** textbox, and then enter the stage information of every stage, including the time, speed and grade. After that, press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press ↵ to confirm.

NOTE: When **Time** of a stage in the exercise phase is set to **00**, this stage and its following stages in the exercise phase will not be carried out.

2. Edit

Select a protocol on the **Protocol Manager** screen by pressing the Up or Down arrow, and press the function key **F2** below **Edit** to display the **Edit Protocol** dialog box. Then you can edit the protocol information.


Edit Protocol
Protocol Name Modified Bruce
Phase Stage Time (min) Speed (mph) Slope (%)
Pretest Stage 1 10 00.0 00
Exercise Stage 1 03 01.7 00
Exercise Stage 2 03 01.7 05
Exercise Stage 3 03 01.7 10
Exercise Stage 4 03 02.5 12
Exercise Stage 5 03 03.4 14
Exercise Stage 6 03 04.2 16
Exercise Stage 7 03 05.0 18
Recovery Stage 1 03 01.5 00
OK
Cancel

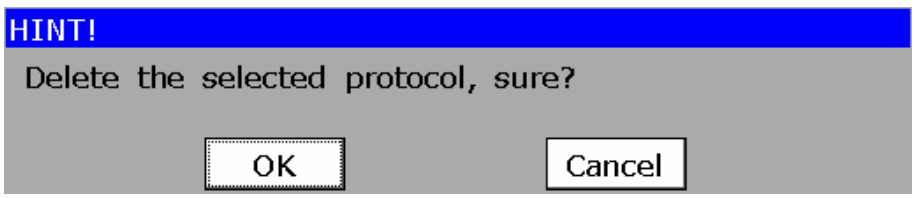
NOTE: For the Bruce or Modified Bruce protocol, only the stage information of the pretest and recovery phases can be edited.

3. Select

Select a protocol on the **Protocol Manager screen** by pressing the Up or Down arrow, and press the function key **F3** below **Select** to set the selected protocol as the default protocol.

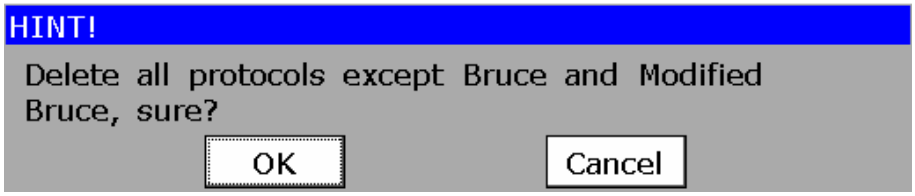
4. Delete

Select a protocol on the **Protocol Manager screen** by pressing the Up or Down arrow, and press the function key **F4** below **Delete** to display the following dialog box. Press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press ↵ to delete the selected protocol.



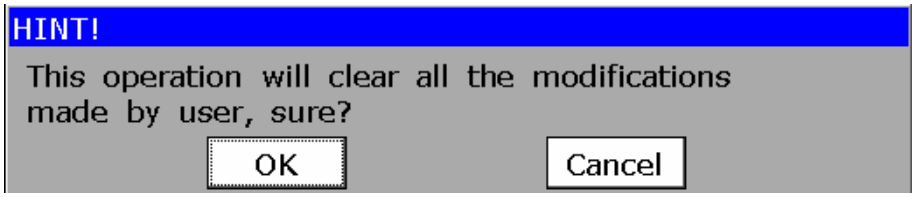
5. Del All

To delete all the protocols from the **Protocol Manager screen**, you can press the function key **F5** below **Del All** to display the following dialog box. Press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press ↵ to delete all the protocols.



6. Restore

Press the function key **F6** below **Restore** to display the following dialog box. Press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press ↵ to restore the factory settings.



7. Return

Press the function key **F7** below **Return** to return to the **System Setup screen**.

Chapter 13 Turning off the Electrocardiograph

When the battery is used, hold down the key to display the hint *System is shutting down…* on the screen. Then the device will be off a few seconds later.

When the mains supply is used, hold down the key to display the hint *System is shutting down…* on the screen. Then the device will be off a few seconds later. Remove the plug from the outlet.

NOTE:

1. When turning off the device, follow the above sequence strictly, or else there will be something wrong on the screen.
2. Do not hold down the key when the device displays the hint information *System is shutting down…* on the screen.

Chapter 14 Hint Information

Hint information and the corresponding causes provided by the electrocardiograph are listed in the following tables.

Table 14-1 Hint Information and Causes

Hint Information	**Causes**
Lead off	Electrodes fall off the patient or the patient cable falls off the unit, or a high polarization voltage occurs..
Battery Weak	The battery is weak.
No Paper	Recorder paper runs out or is not loaded.
Paper Error	When **Paper Marker** is set to **Yes**, the electrocardiograph advances the recorder paper to the next black marker. If it advances the paper for 300mm and can not find the next black marker, the hint *Paper Error* is displayed.
Testing	The ECG data is being sampled periodically.
Sampling/Analyzing/ Recording	ECG signals are being sampled / analyzed / recorded.
Learning	The self-study process of arrhythmia arithmetic in the **Trigger Sample** mode
Detecting	The examining process of arrhythmia data in the **Trigger Sample** mode
Transmitting	ECG data is being transmitted from the electrocardiograph to the PC through the net or serial cable in the auto, rhythm or off mode.
Transmit Fail	ECG data fails to be transmitted from the electrocardiograph to the PC through the net or serial cable in the auto, rhythm or off mode.
Memory Full	The amount of files on the **File Manager screen** of SE-12 exceeds 100. The amount of files on the **File Manager screen** of SE-12 Express exceeds 200.
Module Error	There is something wrong with the signal sample module.
DEMO	The system is in the demonstration mode.
Overload	The direct current offset voltage on an electrode is too high.
U Disk / USB Printer / USB Scanner	A U disk, a USB printer or a bar code reader is connected to the USB interface.

Table 14-2 Hint Information and Causes for Exercise ECG

Hint Information	**Causes**
Battery Weak	The battery is weak.
No Paper	Recorder paper runs out or is not loaded.
Paper Error	When **Paper Marker** is set to **Yes**, the electrocardiograph advances the recorder paper to the next black marker. If it advances the paper for 300mm and can not find the next black marker, the hint *Paper Error* is displayed.
Module Error	There is something wrong with the signal sample module.
DEMO	The system is in the demonstration mode.
Lead X off	Electrodes fall off the patient or the patient cable falls off the unit.
Overload	The direct current offset voltage on an electrode is too high.
No Testing	No test is being carried out.
Testing…	An exercise test is being carried out.
Testing Stop	An exercise test is terminated.
HR Overrange!	Heart rate exceeds the normal range.
Sys. Overrange!	Systolic blood pressure exceeds the normal range.
Dia. Overrange!	Diastolic blood pressure exceeds the normal range.

Chapter 15 Cleaning, Care and Maintenance

CAUTION

1. Turn off the power before cleaning and disinfection. The mains supply must be switched off if it is used.
2. Prevent the detergent from seeping into the equipment.

15.1 Cleaning

CAUTION

Any remainder of detergent should be removed from the unit and the patient cable after cleaning.

15.1.1 Cleaning the Main Unit and the Patient Cable

To clean the electrocardiograph:

1. Unplug the AC power cord.
2. Wipe the external surfaces of the electrocardiograph with a soft cloth dampened in any of the approved cleaning solutions listed below.

To clean the patient cable:

1. Dampen a soft cloth with one of the disinfectants or cleaning agents listed below.
2. Wring excess moisture from the cloth before cleaning.

Recommended Cleaning Solutions

- Mild soap and water
- 75% alcohol

15.1.2 Cleaning the Reusable Electrodes

To clean reusable electrodes:

1. Remove the remainder gel from the electrodes with a clean soft cloth first.
2. Take suction bulbs and metal cups of chest electrodes apart, and take clamps and metal parts of limb electrodes apart.

3. Clean them in warm water and make sure there is no remainder gel.
4. Dry the electrodes with a clean dry cloth or air dry naturally.

CAUTION

Do not clean the unit and accessories with abrasive fabric and avoid scratching the electrodes.

15.1.3 Cleaning the Print Head

To clean the print head:

1. Open the recorder casing and remove the paper.
2. Wipe the print head gently with a clean soft cloth damped in 75% alcohol.
   For stubborn stain, soak it with a little alcohol first and wipe it off with a clean soft cloth.
3. After air drying, load the recorder paper and shut the recorder casing.

Dirty and soiled thermal print head will deteriorate the printing definition. So it should be cleaned at least once a month regularly.

CAUTION

Prevent the detergent from seeping into the main unit while cleaning. Do not immerse the unit or the patient cable into liquid under any circumstances.

15.1.4 Cleaning the Treadmill

For details on cleaning the treadmill, please refer to *Treadmill User Manual*.

15.2 Disinfection

Disinfection of the main unit is not necessary need in daily maintenance, it is only necessary in operating room. In that case, please use hospital standard disinfectant.

NOTE: Clean and disinfect the chest and limb electrodes after each use.

CAUTION

1. Do not use high-temperature, high-pressure vapour or ionizing radiation as disinfection methods.
2. Do not use chloric disinfectant such as chloride, sodium hypochlorite etc.

15.3 Care and Maintenance

CAUTION

Operate the electrocardiograph, charge the battery, and store the battery at a temperature of 40℃(104ºF) or lower. Exposure to higher or lower temperature may reduce battery life, damage the battery, and degrade overall electrocardiograph performance.

15.3.1 Recharge and Replacement of Battery

1) Capacity Identification

The current capacity of the battery can be identified according to the battery symbol in the top right corner of the LCD screen.

: Full capacity;
: 2/3 capacity;
: 1/3 capacity;
: Empty

2) Recharge

The 12-channel electrocardiograph is equipped with the recharge control circuit together with battery. When the unit is connected to the mains supply, the battery will be recharged automatically. Then the battery recharging indicator (⇥▭) and the mains supply indicator (∿) will be lit at the same time. During the recharging course, the symbol ▭ flashes in the top right corner of the LCD screen. After the battery is fully recharged, the symbol stops flashing, and the battery recharging indicator (⇥▭) is black.

Because of the capacity consumption during the storage and transport course, the battery capacity is not full when it is used for the first time. Battery recharge should be considered before the first use.

CAUTION

Repeated undercharging of the battery will damage the battery and reduce battery life.

3) Replacement

When the useful life of the battery is over, or foul smell and leakage are found, please contact the manufacturer or the local distributor for replacement.

WARNING

1. Only qualified service engineers authorized by the manufacturer can open the battery compartment and replace the battery, and the battery of the same model and specification provided by the manufacturer must be used.
2. Danger of explosion -- Do not reverse the anode and the cathode when installing the battery.
3. Remove the battery from the electrocardiograph when the electrocardiograph is not used for a long time.
4. If the battery is stored alone and not used for a long time, we recommend that the battery should be charged at least once every 6 months to prevent overdischarge.
5. When the battery's useful life is over, contact the manufacturer or the local distributor for disposal or dispose of the battery according to local regulations.

CAUTION

If the battery has been fully charged and requires recharging after printing only a few ECGs, consider replacement.

15.3.2 Recorder Paper

NOTE: Recorder paper provided by the manufacturer should be used. Other paper may shorten the life of the thermal print head. The deteriorated print head may lead to illegible ECG reports and block the advance of the paper.

Storage Requirements:

- Recorder paper should be stored in a dry, dark and cool area, avoiding excessive temperature, humidity and sunshine.
- Do not put the recorder paper under fluorescence for a long time.
- Make sure that there is no polyvinyl chloride or other chemicals in the storage environment, which will lead to color change of the paper.

- Do not overlap the recorder paper for a long time, or else the ECG reports may trans-print each other.

15.3.3 Visual inspection

Perform a visual inspection of all equipment and peripheral devices daily. If you notice any items that need repair, contact a qualified service engineer to make the repairs.

- Check the case and display screen for cracks or other damage.
- Regularly inspect all plugs, cords, cables, and connectors for fraying or other damage.
- Verify that all cords and connectors are securely seated.
- Inspect keys and controls for proper operation.

15.3.4 Maintenance of the Main Unit and the Patient Cable

CAUTION

Besides the maintenance requirements recommended in this manual, comply with local regulations on maintenance and measurement.

The following safety checks should be performed at least every 12 months by a qualified person who has adequate training, knowledge, and practical experience to perform these tests.

1. Inspect the equipment and accessories for mechanical and functional damage.
2. Inspect the safety related labels for legibility.
3. Inspect the fuse to verify compliance with the rated current and circuit-breaking characteristics.
4. Verify that the device functions properly as described in the instructions for use.
5. Test the protection earth resistance according to IEC/EN 60601-1: Limit: 0.1ohm.
6. Test the earth leakage current according to IEC/EN/UL 60601-1: Limit: NC/SFC 300μA.
7. Test the enclosure leakage current according to IEC/EN/UL 60601-1: Limit: NC 100μA, SFC 300μA.

8. Test the patient leakage current according to IEC/EN 60601-1: Limit: NC a.c. 10μA, d.c. 10μA; SFC a.c. 50μA, d.c. 50μA.

9. Test the patient auxiliary current according to IEC/EN 60601-1: Limit: NC a.c. 10μA, d.c. 10μA; SFC a.c. 50μA, d.c. 50μA.

10. Test the patient leakage current under single fault condition with mains voltage on the applied part according to IEC/EN 60601-1: Limit: 50μA (CF).

The leakage current should never exceed the limit. The data should be recorded in an equipment log. If the device is not functioning properly or fails any of the above tests, the device has to be repaired.

WARNING

Failure on the part of the responsible individual hospital or institution employing this equipment to implement a satisfactory maintenance schedule may cause undue equipment failures and possible health hazards.

1) Main Unit

- Avoid excessive temperature, sunshine, humidity and dirt.
- Put the dustproof coat on the main unit after use and prevent shaking it violently when moving it to another place.
- Prevent any liquid from seeping into the equipment; otherwise the safety and the performance of the electrocardiograph can not be guaranteed.

2) Patient Cable

- Integrity of the patient cable, including the main cable and lead wires, should be checked regularly. Make sure that it is conductible.
- Do not drag or twist the patient cable with excessive stress while using it. Hold the connector plug instead of the cable when connecting or disconnecting the patient cable.
- Align the patient cable to avoid twisting, knotting or crooking in a closed angle while using it.
- Store the lead wires in a big wheel to prevent any people from stumbling.
- Once damage or aging of the patient cable is found, replace it with a new one immediately.

3) Reusable Electrodes

- Electrodes must be cleansed after use and make sure there is no remainder gel on them.
- Keep suction bulbs of chest electrodes away from sunshine and excessive temperature.
- After long-term use, the surfaces of electrodes will be oxidized because of erosion and other causes. By this time, electrodes should be replaced to achieve high-quality ECG records.

CAUTION

The device and accessories are to be disposed of according to local regulations after their useful lives. Alternatively, they can be returned to the dealer or the manufacturer for recycling or proper disposal.

Chapter 16 Accessory List

WARNING

Only the patient cable and other accessories supplied by the manufacturer can be used. Or else, the performance and electric shock protection can not be guaranteed.

Accessory	**Part Number**
ECG Cable (European)	01.57.107581 (Snap Style)
	01.57.107583 (Grabber Style)
ECG Cable (American)	01.57.107582 (Snap Style)
	01.57.107584 (Grabber Style)
Patient Cable (American)	01.57.107048
Patient Cable (European)	01.57.106902
ECG Chest Electrodes	02.04.110842
ECG Limb Electrodes	02.04.110843
Pediatric Disposable Adhesive Electrodes	11.57.40024
Disposable Neonatal Electrode	11.57.40109
Adult Disposable Adhesive Electrodes	11.57.040159
Disposable Resting Tab electrodes (1 piece)	11.57.040189
Power cord (European)	01.13.36014
Power cord(American)	01.13.036106
Power cord (American)	11.13.36015
Rechargeable Li-ion Battery	21.21.064146
Snap/Banana Socket Adapters	01.13.107449
Clip/Snap/Banana Socket Adapter	01.57.040172
Alligator Clip/Banana Socket Adapters	01.57.040173
Paper Roller	01.51.30340-01
Thermal Recorder Paper	01.57.107371
Fuse	11.21.64073

Input/Output Connector	11.13.19907
Grounding Wire	11.13.114214
Smart ECG Viewer Software	03.24.38952
	03.24.38953
Snap Clip	01.57.040172
Electrode Gel	11.25.78047
RS232 Cable	11.13.20117
Ethernet Cable	11.13.20096
Smart ECG viewer Software Key/TINY-SPRO	01.18.47116
Smart ECG viewer Software Key/USB	12.01.47194
DeskJet/HP2368	11.18.52168
U Disk	11.18.78105
ECG Bag	11.56.78118
SD Card Reader	11.17.047324
MT-801 Trolley	03.28.107634
12V Vehicle-carried Inverter	11.21.64056
Bar Code Reader	11.23.068003
Wireless AP	11.17.047338

The 12-channel electrocardiograph and accessories are available by contacting the manufacturer or your local distributor.

NOTE：The chest electrodes, limb electrodes, pediatric chest electrodes and pediatric limb electrodes are not available in the U.S.

Chapter 17 Warranty & Service

17.1 Warranty

EDAN warrants that EDAN's products meet the labeled specifications of the products and will be free from defects in materials and workmanship that occur within warranty period.

The warranty is void in cases of:

a) damage caused by mishandling during shipping.

b) subsequent damage caused by improper use or maintenance.

c) damage caused by alteration or repair by anyone not authorized by EDAN.

d) damage caused by accidents.

e) replacement or removal of serial number label and manufacture label.

If a product covered by this warranty is determined to be defective because of defective materials, components, or workmanship, and the warranty claim is made within the warranty period, EDAN will, at its discretion, repair or replace the defective part(s) free of charge. EDAN will not provide a substitute product for use when the defective product is being repaired.

17.2 Contact information

If you have any question about maintenance, technical specifications or malfunctions of devices, contact your local distributor.

Alternatively, you can send an email to EDAN service department at: support@edan.com.cn.

Appendix 1 Technical Specifications

A1.1 Safety Specifications

Comply with:		IEC/EN 60601-1+A1+A2, IEC/EN 60601-1-2+A1, IEC/EN 60601-2-25, ANSI/AAMI EC11, IEC/EN 60601-2-51, UL 60601-1, CAN/CSA C22.2 No.601.1
Anti-electric-shock type:		Class I with internal power supply
Anti-electric-shock degree:		CF type with defibrillation-proof
Degree of protection against harmful ingress of water:		Ordinary equipment (Sealed equipment without liquid proof)
Disinfection/sterilization method:		Refer to the user manual for details
Degree of safety of application in the presence of flammable gas:		Equipment not suitable for use in the presence of flammable gas
Working mode:		Continuous operation
EMC:		Group I, Class A
Patient Leakage Current:	NC	<10μA (AC) / <10μA (DC)
	SFC	<50μA (AC) / <50μA (DC)
Patient Auxiliary Current:	NC	<10μA (AC) / <10μA (DC)
	SFC	<50μA (AC) / <50μA (DC)

A1.2 Environment Specifications

	Transport & Storage	Working
Temperature:	-20℃ (-4ºF) ~ +55℃ (+131ºF)	+5ºC (+41ºF) ~ +40ºC (+104ºF)
Relative Humidity:	25%~93% Non-Condensing	25%~80% Non-Condensing
Atmospheric Pressure:	700hPa ~1060hPa	860hPa ~1060hPa

A1.3 Physical Specifications

Dimensions	SE-12: 420mm×330mm×105mm (16.5in×13.0in×4.1in) SE-12 Express: 420mm×330mm×120mm (16.5in×13.0in×4.7in)
Weight	SE-12: approx. 5.0kg (11.0 lbs); SE-12 Express: approx. 6.5kg (14.3 lbs) (Excluding recorder paper and battery)
Display	320×240 dot single color LCD Screen 800×600 multicolor LCD Screen

A1.4 Power Supply Specifications

Mains Supply:	Operating Voltage = 100V-240V~
	Operating Frequency = 50Hz/60Hz
	Input Current = 0.9-0.4A
Internal Li-ion Battery Pack:	SE-12 Express: Rated voltage = 14.8V SE-12: Rated voltage = 14.8V
	SE-12 Express: Rated capacity = 4400mAh SE-12: Rated capacity = 2200mAh
	When the battery is fully charged, SE-12 can work normally about 4 hours, and it can continually print about 1.5 hours in the manual mode or print about 300 ECG reports of 3×4+1R in the auto mode; SE-12 Express can work normally about 5 hours, and it can continually print about 2.5 hours in the manual mode or print about 350 ECG reports of 3×4+1R in the auto mode.
	Charge mode: Constant current/voltage
	SE-12 Express: Charge current (standard) = 0.14 C_5A (600mA) SE-12: Charge current (standard) = 0.28 C_5A (600mA)
	Charge voltage (standard) = (16.8-0.1V)
	Necessary Charge time: SE-12 Express: 9.5 hours SE-12: 5 hours

	Cycle life ≥ 300 times
Fuse:	T1AL250VP Ø5×20

A1.5 Performance Specifications

Recording	
Recorder:	Thermal dot-matrix recorder
Printing Density	8 dots per mm / 200 dots per inch (amplitude axes) 40 dots per mm / 1000 dots per inch (time axes, @ 25 mm/s)
Recorder Paper:	Folded thermal paper: 210mm×295mm×100pages Folded thermal paper: 215mm×280mm×100pages (Optional) Rolled thermal paper: 210mm×30m (Optional)
Effective Width:	203mm
Paper Speed:	5mm/s, 6.25mm/s, 10mm/s, 12.5mm/s, 25mm/s, 50mm/s（±3%）
Accuracy of data:	±5% (x-axis), ±5%(y-axis)
HR Recognition	
Technique:	Peak-peak detection
HR Range:	30 BPM ~300 BPM
Accuracy:	±1 BPM
ECG Unit	
Leads:	12 standard leads
Acquisition Mode:	simultaneously 12 leads
A/D Resolution:	24 bits
Time Constant:	≥3.2s
Frequency Response:	0.05Hz ~ 150Hz (-3dB)
Gain:	2.5, 5, 10, 20, 10/5, AGC (mm/mV)
Input Impedance:	≥50MΩ (10Hz)
Input Circuit Current:	≤0.01μA
Input Voltage Range	≤±5 mVpp

Calibration Voltage:	1mV±2%
DC Offset Voltage:	±600mV
Noise:	≤12.5 μVp-p
Multichannel crosstalk	≤0.5mm
Filter	AC Filter: On/Off
	DFT Filter: 0.05Hz/0.15Hz/0.25Hz/0.32Hz/0.5Hz/0.67Hz
	EMG Filter: 25Hz/35Hz/45Hz/OFF
	LOWPASS Filter:150Hz/100Hz/75Hz
CMRR	≥115dB
Sampling Frequency	1000 Hz
Pacemaker Detection	
Amplitude	±2 to ±700 mV
Width	0.1 to 2.0 ms
Sampling Frequency	10,000/sec/channel
External Input/Output (Optional)	
Input	≥100kΩ; Sensitivity 10mm/V±5%; Single ended
Output	≤100Ω; Sensitivity 1V/mV±5%; Single ended

NOTE:

1. Test the accuracy of input signal reproduction according to the methods described in clause 4.2.7.2 in ANSI/AAMI EC11:1991/(R) 2001, and the result complies with the clause 3.2.7.2 in ANSI/AAMI EC11:1991/(R) 2001.
2. Overall System Error is tested using the method described in AAMI EC11 3.2.7.1. Overall System Error is not more than ±5%.
3. Frequency Response is tested using the method described in AAMI EC11 3.2.7.2 methods A and D.

Appendix 2 EMC Information

Guidance and manufacture's declaration - electromagnetic emissions - for all EQUIPMENT and SYSTEMS

<table>
<tr><th colspan="3">Guidance and manufacture's declaration – electromagnetic emission</th></tr>
<tr><td colspan="3">The 12-channel electrocardiograph is intended for use in the electromagnetic environment specified below. The customer or the user of the 12-channel electrocardiograph should assure that it is used in such an environment.</td></tr>
<tr><th>Emission test</th><th>Compliance</th><th>Electromagnetic environment – guidance</th></tr>
<tr><td>RF emissions
CISPR 11</td><td>Group 1</td><td>The 12-channel electrocardiograph uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.</td></tr>
<tr><td>RF emission
CISPR 11</td><td>Class A</td><td rowspan="3">The 12-channel electrocardiograph is suitable for use in all establishments, other than domestic and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.</td></tr>
<tr><td>Harmonic emissions
IEC/EN 61000-3-2</td><td>Class A</td></tr>
<tr><td>Voltage fluctuations/ flicker emissions
IEC/EN 61000-3-3</td><td>Complies</td></tr>
</table>

Guidance and manufacture's declaration – electromagnetic immunity - for all EQUIPMENT and SYSTEMS

Guidance and manufacture's declaration – electromagnetic immunity			
The 12-channel electrocardiograph is intended for use in the electromagnetic environment specified below. The customer or the user of 12-channel electrocardiograph should assure that it is used in such an environment.			
Immunity test	**IEC/EN 60601 test level**	**Compliance level**	**Electromagnetic environment - guidance**
Electrostatic discharge (ESD) IEC/EN 61000-4-2	±6 kV contact ±8 kV air	±6 kV contact ±8 kV air	Floors should be wood, concrete or ceramic tile. If floor are covered with synthetic material, the relative humidity should be at least 30%.
Electrical fast transient/burst IEC/EN 61000-4-4	±2 kV for power supply lines	±2 kV for power supply lines	Mains power quality should be that of a typical commercial or hospital environment.
Surge IEC/EN 61000-4-5	±1 kV line to line ±2 kV line to ground	±1 kV line to line ±2 kV line to ground	Mains power quality should be that of a typical commercial or hospital environment.
Power frequency (50Hz/60Hz) magnetic field IEC/EN 61000-4-8	3A/m	3A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.
Voltage dips, short interruptions and voltage variations on power supply input lines IEC/EN 61000-4-11	<5% U_T (>95% dip in U_T) for 0.5 cycle 40% U_T (60% dip in U_T) for 5 cycles 70% U_T	<5% U_T (>95% dip in U_T) for 0.5 cycle 40% U_T (60% dip in U_T) for 5 cycles 70% U_T	Mains power quality should be that of a typical commercial or hospital environment. If the user of the 12-channel electrocardiograph requires continued operation during power mains interruptions, it is recommended that the

	(30% dip in U_T) for 25 cycles <5% U_T (>95% dip in U_T) for 5 sec	(30% dip in U_T) for 25 cycles <5% U_T (>95% dip in U_T) for 5 sec	12-channel electrocardiograph be powered from an uninterruptible power supply or a battery.
NOTE U_T is the a.c. mains voltage prior to application of the test level.			

Guidance and manufacture's declaration – electromagnetic immunity - for EQUIPMENT and SYSTEMS that are not LIFE-SUPPORTING

Guidance and manufacture's declaration – electromagnetic immunity			
The 12-channel electrocardiograph is intended for use in the electromagnetic environment specified below. The customer or the user of the 12-channel electrocardiograph should assure that it is used in such an environment.			
Immunity test	**IEC/EN 60601 test level**	**Compliance level**	**Electromagnetic environment - guidance**
Conducted RF IEC/EN 61000-4-6 Radiated RF IEC/EN 61000-4-3	3 V_{rms} 150 kHz to 80 MHz 3 V/m 80 MHz to 2.5 GHz	$3V_{rms}$ 3 V/m	Portable and mobile RF communications equipment should be used no closer to any part of the 12-channel electrocardiograph, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. **Recommended separation distance** $d = 1.2\sqrt{P}$ $d = 1.2\sqrt{P}$ 80 MHz to 800 MHz $d = 2.3\sqrt{P}$ 800 MHz to 2.5 GHz Where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in metres (m). Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey,[a] should be

			less than the compliance level in each frequency range.[b] Interference may occur in the vicinity of equipment marked with the following symbol:

NOTE 1 At 80 MHz and 800 MHz, the higher frequency range applies.

NOTE 2 These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

[a] Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the 12-channel electrocardiograph is used exceeds the applicable RF compliance level above, the 12-channel electrocardiograph should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as reorienting or relocating the 12-channel electrocardiograph.

[b] Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 3 V/m.

Recommended separation distances between portable and mobile RF communications equipment and the EQUIPMENT or SYSTEM - for EQUIPMENT or SYSTEM that is not LIFE-SUPPORTING

Recommended separation distances between

portable and mobile RF communications equipment and the 12-channel Electrocardiograph

The 12-channel electrocardiograph is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the 12-channel electrocardiograph can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the 12-channel electrocardiograph as recommended below, according to the maximum output power of the communications equipment.

Rated maximum output power of transmitter (W)	**Separation distance according to frequency of transmitter(m)**		
	150 kHz to 80 MHz $d = 1.2\sqrt{P}$	**80 MHz to 800 MHz** $d = 1.2\sqrt{P}$	**800 MHz to 2.5 GHz** $d = 2.3\sqrt{P}$
0.01	**0.12**	**0.12**	**0.23**
0.1	**0.38**	**0.38**	**0.73**
1	**1.2**	**1.2**	**2.3**
10	**3.8**	**3.8**	**7.3**
100	**12**	**12**	**23**

For transmitters rated at a maximum output power not listed above, the recommended separation distance d in meters (m) can be estimated using the equation applicable to the frequency of the transmitter, where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.

NOTE 1 At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies.

NOTE 2 These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

Appendix 3 Abbreviation

Abbr	**English**
LCD	Liquid Crystal Display
BP	Blood Pressure
ECG	Electrocardiogram/Electrocardiograph
HR	Heart Rate
aVF	Left Foot Augmented Lead
aVL	Left Arm Augmented Lead
aVR	Right Arm Augmented Lead
LA	Left Arm
LL	Left Leg
RA	Right Arm
RL	Right Leg
ID	Identification
AC	Alternating Current
USB	Universal Serial Bus
AGC	Auto Gain Control

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EDANUSA
www.edanusa.com

4901 Morena Blvd., Suite 505
San Deigo, CA 92117
Tel: 888.850.4597